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DR. R. U. PIPER'S REPORT

ON

DISEASED MILK,

AND

The Flesh of Animals Used for Human Food.

COOPER MEDICAL COLLEGE
San Francisco, Cal.

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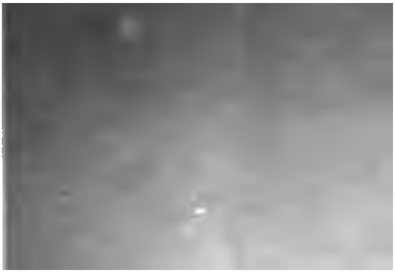

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45

Published and Unpublished Works and Papers of R. U. Piper, M. D., Chicago.

1. **Operative Surgery,** with 1900 illustrations etched on stone, by the Author. Boston, 1852.
2. **Plates of McClisel's Surgical Anatomy,** etched on copper, by Dr. Piper, 36 plates, with descriptions. Boston, 1847.
3. **Trees of America,** with 12 original etchings on steel, (unfinished), Boston, 1855.
4. **Papers on Agriculture, Arboriculture, Etc.,** published in New York Evening Post, 1865.
5. **Things to be Seen by the Sea,** illustrated. 10 plates. Nahant, 1862.
6. **Papers in American Law Register.** Microscopical examinations of blood stains in Criminal Trials, with illustrations. Vol. 15, 1876; vol. 16, 1877; vol. 17, 1878.
7. **Papers in Chicago Legal News.** Use of the Microscope in Medico-Legal cases, with illustrations. Dec. 1877, Jan. 1878, Feb. 1878.
8. **Review of Scientific Testimony in the Richardson Murder Case.** Canton, Ohio. 1876.
9. **Contraction of Blood Corpuscles through the Action of Cold.** New York Medical Journal, original illustrations. March, 1877.
10. **Report on the Lake Water as Supplied to the City of Chicago.** Original illustrations. July, 1877.
11. **Report on Milk and the Flesh of Animals used for Human Food.** 18 Original illustrations. Chicago, 1879.
12. **Paper on Hog Cholera.** Chicago Times, Sept., 1878.
13. **Falsifications and Alterations of Legal Documents and Papers.—** Illustrated, 1879
14. **Paper on the Adulteration of Food, Paints, &c.,** with eight original microscopic plates, 1877.
15. **Five Papers on Arsenic Green.** 1877.
16. **Methods of Analyzing White Lead, Prussian Blue, Vermillion, &c.** 1875.
17. **Paper on Bright's Disease in Man and Swill-fed Cattle.** Two original plates, 1879. Paper with two original engravings on the Pictorial Art in illustrating microscopic observations, with two original drawings. Chicago Medical Journal, March 1877.
18. **Treatise on Paints, Oils, and Painting.** Chicago. 1874.

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19. **Lecture on the use of the Microscope in Legal Investigations,** before the College of Law. Chicago, 1879.
20. **Lecture on the Life and Writings of Wm. Cullen Bryant.** 1879.
21. **Work on the Natural History of Nahant.** Forty original etchings. 1868
22. **Paper on the Sucking Apparatus of the House-Fly.** 1876.
23. **Paper on Experiments with the Poison of the Rattle-Snake.** 1878.
24. **Paper on the Disease of the Kidneys in Swill-fed Cattle.** 1878.
25. **Microscopical Examinations of Vegetable Poisons.** Twenty original plates. 1879.
26. **Lecture on Alcoholic Drinks,** delivered at the Washingtonian Home, with forty original magic lantern slides, 1878.
27. **The Microscope.** Paper read before the Illinois State Microscopical Society
28. **Revelations of the Microscope.** Lecture delivered before the Young Men's Christian Association. Chicago.
29. **Lecture on the use of the Microscope,** delivered before the Chicago Society Physicians and Surgeons.
30. **Blood Stains.** Lecture delivered before the College of Law. 1878.
31. **Lecture on Blood,** delivered before the West Chicago Medical Society. 1878

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REPORT ON DISEASED MILK AND FLESH.

Early in the summer of 1877, the Editors of the *Inter Ocean* newspaper, of Chicago, called my attention to the subject of this paper, and engaged me to "make a thorough examination of the matter." To this end I spent some months of careful study, the results of which were in the main embodied in an article published in that paper September 27. This, with other papers on the same subject, it has been thought best, by many persons, professional and others, who realize its importance in various directions, to embody in a pamphlet form, and thus render them accessible to the public generally.

The articles in the *Chicago Times* were the result of still more extended observation in the same direction, including, as a special matter, the no less important question of the effects of distillery feeding upon the health of the cattle themselves with reference to their flesh being used as an article of human food. If feeding upon distillers' or brewers' mash produces diseased flesh, the question as a scientific matter then would be whether such flesh was a fit and safe article of diet, This question would seem to be fully answered in the following pages. That such kind of feeding does produce diseased flesh, as well as diseased milk, no disinterested person has pretended to dispute. None but hired advocates have as yet publicly taken the opposite side of the question, and of these not one was a physician. On the other hand, every physician whom the author has consulted on the subject, agrees with those whose opinions are given in this pamphlet.

Since writing the articles in the newspapers, the author has received letters from many sources, approving of them and giving additional testimony as to the validity of the statement that animals kept even for a very short time upon the kinds of food alluded to above, all manifest symptoms of disease.

Among these I take the liberty to quote from the statements of two Government officers, Messrs. Swan and Warren, who were for years stationed at the distilleries, and who had daily opportunities for observing the facts to which they testify:

Mr. Swan states that among other troubles at least one-tenth of the whole number had diseased glands of the neck. The disease in this proportion of cases being evident to the most superficial observation.

This disease often showed itself in large running sores. These cattle were known to be killed and sold in the market as beef. In one instance, and only one, had he ever known any of these cattle to be seized by the health officers. In that case five were seized and condemned after they had been sold and got out of the stables. And in these five cases the sores were no worse or more foul to the eye, or more fetid to the smell, or the general appearance of the

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animals more loathsome than hundreds of others which are constantly being killed and eaten in the city of Chicago and elsewhere.

Mr. Warren, in addition to confirming the general statement, adds that the flesh of these animals very rapidly passes into the putrefactive state. And this fact is also attested to by several respectable butchers whom the author consulted during the process of these investigations.

It will be seen by the above that the plea which is set up that mixed food is used in these cases, so far from being an answer to the general proposition, still more confirms it, as this testimony gives the actual result of such keeping upon this *same mixed food.*

All the engravings in the pamphlet were made from original drawings by the author. These drawings represent what was seen under the microscope in these cases, and have been well interpreted in wood by Messrs. Baker & Co.

Since the publication of these papers, the author has made examinations of the blood of hogs dying of cholera. This blood, as also that described by Professor Beal as seen in cases of the cattle disease in England, appears like many of the specimens of the same blood obtained from distillery-fed cattle.

As we are told that "diseases do not spring from the ground," who shall say that at some future time a disease may not in this way be developed which shall spread throughout the country, and prove as fatal as did the rhinderpest, which, in three years' time, destroyed eighty thousand cattle and horses, and five hundred human beings in a single district in Russia.

It would certainly seem to be wise for farmers and stock-raisers to at least take proper precautions in view of such a contingency.

As these articles were intended for the general public, the author has endeavored to avoid all technical language, and to present the facts in such a form that they may be clearly understood by non-professional as well as professional readers. The object of all engaged in their production is to inform the public so that they may take efficient measures to the end of breaking up the whole nefarious business of making and selling poisonous beef and poisonous milk.

R. U. PIPER, *68 Centre Avenue*, *Chicago*, *Ill.*

MR. EDITOR: This investigation I have endeavored, in accordance with your expressed desire, to make as thorough as possible, in order that the public might understand the matter and be made fully aware of the grave danger to which they are daily exposed from impure, diseased, and poisoned milk.

To this end, that is, in order to give a full and reliable statement of the case while pursuing actual personal investigations, I have consulted the authorities as far as I have had time to do so. In recording my observations I shall set down as original only those facts which have passed under my notice, or which are the result of experiments made by my own hands.

By impure milk, I mean milk adulterated by any foreign substance whatever. Under this head might, perhaps, be included milk poisoned in any manner, but I shall apply the term poisoned, to milk which has actual poisonous substances mixed with it, either after it has been drawn from the cow, or when such substances have been administered to the animal, and have got into the milk through the process of secretion. By diseased milk, I mean that which is rendered so through the diseased state of the animal from which it is obtained, and also that which has passed into a state of disease and decay in the ordinary physical changes to which it is subject. This last might, perhaps, be classed as well under the head of poisoned milk, as its effect is that of poison upon the human system, but I have chosen to confine this term, as far as possible, to where this state has been brought about as described above. There is another kind of fraudulent milk in the market, which, in some cases, is found to be as injurious to the human system as that lowered by water. I have met with three distinct forms of this sophistication. One where most all of the cream has been taken from the milk; another where the milk has been allowed to stand for some time and the top then poured off and sold as cream, or to special customers, while the bottom is supplied to others; and still another, where new milk has been diluted with skimmed milk. Wanklyn speaks of milk being in some cases adulterated by the addition of rice water, bran water, gum water, and emulsion of sheep brains. This is done of course to give milk rendered thin by any cause, the opaque, white appearance which is its usual aspect.

In the many examinations of milk which I have made, I have not found, as yet, either of these forms of sophistication, while some of the others have been present in a large proportion of my cases. Wanklyn says that in the years 1871 and 1872 he was employed by a London journal to make an examination of the general condition of the milk trade in the metropolis, and that after examining one thousand samples, he had come to the conclusion that not over ten per cent. of the milk was genuine. And this examination, it will be remembered, was made by a chemist, merely with reference to adulteration with water and lowering the standard of milk by abstracting the cream. While not neglecting, as far as necessary, chemical and special instrumental examinations, I have made mine also with the microscope, which not only reveals the fact of adulteration, but the still more alarming one that much of our milk is filled with organisms indicating disease, which must add much to the sickness and mortality of the people.

POISONOUS MILK AND DEATHS AMONG CHILDREN.

In a recent article in the New York *Herald*, it is said: "Fully one-half of the deaths among the young are traceable to poisonous milk." This report I shall have occasion to refer to hereafter.

Can milk be injuriously affected to any great extent by substances administered to the animal producing it, or by the absence of certain elements of diet generally recognized to be necessary to a healthy existence?

It is well known that milk may be colored in this way by madder and some other pigment articles, and that it may be rendered disagreeable to the taste by turnips, salt thatch, bitter leaves, etc.

That it can be affected in a similar manner by drugs is shown by the fact that the infant may be purged, narcotized, or salivated by active purgatives, opiates, or mercury introduced into the system of the mother.

"That milk can be poisoned as well as impoverished by the diet of the cow or other milk-producing animal," says Pavy, "all the authorities agree, and of this fact there can be no question." He further says cows' milk may be rendered poisonous to human beings without seeming to injure the animal by the process. "This fact," he says, "has been frequently noticed at Malta, as well as in several parts of this country."

Milk may be rendered unwholesome or poisonous, or liable to pass rapidly into this condition, by being produced from food deprived of one or more of its natural elements, or from the so-called "concentrated foods." This method of feeding of course operates more or less to the injury of the animal subjected to it, and in this case we get diseased milk legitimately from a diseased source.

"We depend upon natural productions," say the authorities, "for our existence, and in order that this may be healthy, these substances must exist in the natural state."

"A duck," says Pavy, "which had been fed entirely on butter, died of starvation at the end of three weeks." Tiedman and Gruelin found geese wer starved in a short time on the white of an egg.

In a recent case in England, a mother was charged with having starved her twin children to death by feeding them upon starch. Her physician testified in court that he had expressly stated to her "that starch alone was not food, but that she persisted in its use in spite of his prohibition." Hence, the death of her children, and hence, also, the criminal trial.

HOW MILK BECOMES POISONOUS.

There is one kind of disease in milk produced as I have found it, in swill milk only, which is analogous, if not identical, with that described by the authorities as follows:

Dr. Parks says: "Milk sometimes becomes specially poisonous by the development of some species of fungi — the oidum lactis or penicillium." "Fuchs noticed this A. D. 1861." Steinhof says this milk gives rise to gastric irritation. Professor Mosler mentions several cases in which it produced severe febrile gastritis. Hessling says: "Such milk has been known to produce cholera-like attacks, and disease of the mouth." He also says this condition of the milk is solely due to the food supplied to the cows.

I have thus specially referred to these authorities, as the forms in my drawings not only correspond with their descriptions, but the cases of disease which I have myself witnessed in this city (which can be traced directly to the use of this same kind of milk) which I have examined, exhibited precisely the symptoms existing in this case.

I give quite a number of cases of disease from the use of adulterated milk, as well as from the use of swill milk, which have come under my observation, and also similar ones in the practice of other physicians, together with the post-mortem appearances seen in cases in which death has resulted from this cause. I have made a large number of examinations, both with the microscope and by other means, and also with other instruments, the result of which are given in this paper.

SICKNESS CAUSED BY SWILL MILK.

In the cases of sickness occasioned by the use of diseased or impoverished milk which have come under my notice, I have been led to the conclusion that the symptoms are, perhaps, due more to actual starvation from the want of the normal amount of nutriment in the food than to its poisonous qualities. I am led to this conclusion from the fact that in cases of starvation, the symptoms, though varied somewhat in individual instances, still agree to a great extent in their graver forms with those attributed in the use of diseased milk. In those cases of starvation as seen in the famine in Ireland, in 1810, there was manifested pallor of the countenance, called by the nurses, the "Hunger face," described by them as a "blue starved look." This aspect is quite distinct from that which utter decline of physical power generally gives in many diseases in which life still continues after the almost entire consumption of the muscular parts of the body. The skin in these cases is rough and dry, and hangs in loose folds. The hair is dry and harsh, and stands up from the head. There is often anasarcous swelling of the ankles ; and in the majority of cases, there is dysentery or chronic diarrhea. This would serve as a full description of the cases of poisoning or starvation from swill milk, as described in a report recently published, and to which I have referred in the first part of my paper. I propose to give a condensed resume of these cases.

Report in N. Y. Herald, July 11, 1877.

CASE 1, "occurring in the practice of a very prominent physician:"

"A stout, healthy, male child, aged fifteen months, soon after being weaned, began to grow pale and thin, and the flesh became soft." "The child was troubled with frequent vomiting and severe diarrhea, which was indescribably painful. The thirst was inordinate and the appetite for milk insatiable." "The skin was dry and flabby, hot when covered with clothing, and damp upon the extremities. The expression of the face was pinched and indicated great pain, while the folds upon the brow showed that the brain fully sympathized with the stomach. The child was sleepless, fretful and irritable." "Medicine was prescribed, but at the same time the milkman was watched, and was traced to the swill milk stable."

"Change of diet, consisting of pure milk with gelatine dissolved in it, and medical care and treatment restored the child in about eight weeks."

CASE 2. In the adjoining house another child, using this same milk, and whom the physician found in a worse state than the first, was too far gone to be benefited by treatment or change of diet. It was healthy when weaned. The discharge from the child's bowels plainly indicated ulceration. The skin was of a dark hue, and hung in folds about the body, excepting over the abdomen, where it was distended and thinned, the bowels feeling hard and knotty to the touch. The cheeks and lips were shriveled, presenting the appearance of old age. The eyes were protuberant and injected.

The child's constant demand while awake, or rather out of stupor, was for "more drink," which it would soon vomit, and then scream for more. "This child died from congestion of brain, superinduced by starvation."

CASE 3. *Susan C.* This child was aged four months. It was fed exclusively upon swill milk. The craving for nourishment was intense, the child consuming large quantities of milk at a time and frequently repeating its demand for more. The abdomen was much distended, emaciation was great, and the child, though filling itself to its full capacity, was still gradually starving to death. A change of milk, with a little gelatine and sugar boiled in it, with some slight medicine, soon restored the little patient to health and cheerfulness.

CASE 4. *Martha M.* This child was put out by her mother, who had obtained a situation as wet-nurse. When the physician was called he found the little one suffering with an enormously distended abdomen and all the symptoms of what is usually called consumption of the bowels. The child died within a week after the physician first saw her her.

CASE 5. This case is of so much interest that I quote it literally:

"O. B., Th—— street, aged fourteen months. This child was found by the physician in his visits made for the purpose of watching the effects of the distillery milk. The child was weaned and was living on milk from the —— distillery, but the man who supplied them was a relative, and they were told it was as good as any. The child was emaciated, having a scrofulous, sickly appearance. The cervical glands were enlarged, the eyes were sore and the lids inflamed. No medicines were given. The milk was changed and the eyes were well in about two weeks, and in a month it was quite evident the whole system was regaining a healthy condition." Medicines are hardly ever requisite in these cases without it is an immediate question of life and death.

MY OWN CASES.

In the cases which have come under my own immediate observation, nearly or quite all of the symptoms described above were present, together with some others which are not given in these reports.

I have made the most thorough examination of the milk used by these little patients, and am prepared to make a full report of the same.

CASE I. A. W., age seventeen months, came to Chicago some few months since; was then very healthy and bright, and had begun to walk alone. Almost as soon as he began to use the milk here, which was obtained for him under the full assurance of the dealer that it was from one cow, and of the best and purest quality, his health gradually failed and he soon lost the power of locomotion. His symptoms became very serious, and a physician was called in, who said these were "mere teething troubles, which were quite common." No examination was made as regarded his food, and the doctor, in the usual routine, prescribed for the symptoms—in the language of a celebrated French physician, "striking in the dark with his own eyes profoundly closed." The baby's eyes were closed also, and for this trouble an occulist was consulted. This gentleman agreed with the first that it was teething trouble, and prescribed something for the eyes that "did a little good."

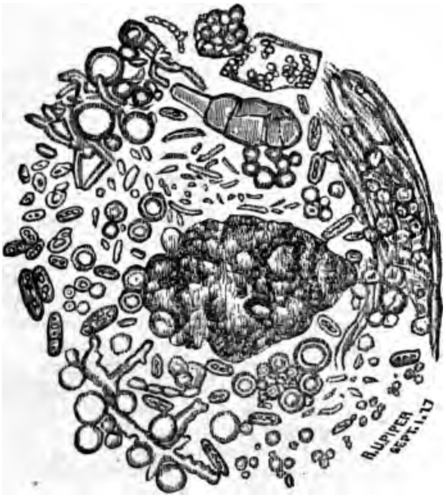


FIG. I.

This was as the case was described to me when it came under my notice.

At this time the following symptoms were present: The face, in the language of friends and attendants, "had a blue, pinched, starved appearance," joined with an expression of pain, which is especially piteous to witness in a baby, and which makes the helpless spectator almost wish for the coming of the kind angel, death. The eyes were closed, much inflamed, and for this reason the little patient was obliged to be kept in a darkened room.

The bowels were swollen and flabby, and there was almost constant diarrhea. Dark purple spots were seen on various parts of the body. In this case, as in the one described above, the craving for nourishment was intense, the child requiring large quantities at short intervals, a pint being taken down at a single time, and then more demanded almost immediately. Joined to this were the usual symptoms of nervous derangement, caused by inanition, showing that the brain and other nervous centres were fast becoming, if they were not already, very seriously involved. Such was the condition of things with this little patient when the milk he was using for food was brought to me for examination. I have given a plate of this milk (Plate 1), as the same milk was involved in another case somewhat similar to this, though by great good fortune far less serious in its results. Upon my examination of this milk it was at once changed for an article which the microscope showed to be healthy and which was found to give nearly three times the amount of cream obtained from the first.

The result of this change of food was almost miraculous. In ten days' time, without medicine and without the doctor, "our little baby is another child," and no longer looks like the fairies' changeling. He has begun to use his feet again, and walk alone, and is one of the bravest, brightest, merriest youngsters of his age which can be found in two cities.

DILUTED SWILL MILK.

CASE 2. The second case which came under my notice I was able to watch myself from day to day during its whole progress. This case was that of a stout, healthy child of six months, which it was necessary at this time to supply with some additional food to that furnished by the mother. Upon this alteration of its diet, it soon began to have long crying fits, for which the doctor gave medicine, but which the nurse interpreted into a cry for food. As in the other cases, more milk being given, more was called for at constantly shortening intervals. This milk, moreover, was watered "by order of the doctor, lest it should be too rich for the child's stomach." In addition to this crying and constant hunger, there was continued diarrhea and other troublesome symptoms. After this condition of things had been allowed to go on for some time, the milk was put into my hands for examination. I found that it was much watered, giving only four of five per cent. of cream. This was swill milk, much diluted, as was clearly shown by the numerous organisms I found in it, which I recognized as coming both from milk and water.

This child recovered very rapidly without medicine upon obtaining milk which gives uniformly from ten to twelve per cent. of cream.

CASE 3. This case is more important from the fact of its being somewhat connected with the first one which came under my own observation than from its grave character.

This little patient, some two years old, was quite sick, however, when I saw him, there appearing some tendency to brain trouble.

As in the other cases "the doctor ordered medicine in accordance with the symptoms."

The milk was brought to me, obtained from the same source as in the first case, "fresh from the cow," as represented by the vendor. The mother of the child, who got the milk herself from the house of the dealer, where she was assured it was just milked, brought it directly to me.

Upon examination this milk was, as seen in the plate, full of fungi, bacteria and forms, found in the lake water. One of these forms will be recognized as one which I have shown in my second plate from that source.

This delectable milk, besides being swill-milk, was made up of old milk, some *new*, perhaps, and warm water, as it was warm when put into my hands. Or perhaps it might have been from a specially sick cow other than the derangement which exists in all cows fed upon still slops or the waste of the breweries.

MORBID APPEARANCES IN CASES OF POISONING AND STARVATION FROM SOPHISTICATED MILK.

In the report alluded to the remark is made that "A marked feature in all the fatal cases of swill milk poisoning is the frightful extent of the emaciation of the victim." As this is the appearance seen in all cases of inanition, I am led to regard it as one of the main causes of death in those instances where it has been traced directly to the use of swill milk, rather than, as a whole, to the actual poisonous nature of the article. Be this as it may, death is none the less certain, whether caused by poisoning or by starvation. In those cases traced directly to the use of swill milk the following after-death appearances were present: "There was no adipose matter in the omentum or mesentery. The liver was of lighter color than natural; the spleen was soft; the intestines were much distended with gas. In some instances there was a yellow acid fluid in the small intestines. The mucous membrane, in these cases, was thickened and softened. The serous coat was tender and easily torn; and the whole intestines had a sour, putrid, offensive odor. The descending colon was ulcerated in many places, the ulcers being of a pale, dirty color. There was great apparent want of blood in the system. The muscles were reduced in size and were pale and flabby. The mesenteric glands were enlarged and were also much diseased. The lungs in many spots were solidified and the membranes of the brain were studded with tubercles."

SWILL MILK VICTIMS.

This report of the post-mortem, as well as the ante-mortem appearances in the cases of the "swill milk victims" might have been copied from those of the "hunger" in Ireland, which I have mentioned before. The London *Times*' account of the matter is in my hands while I am writing this paper.

I may be allowed to quote also on this important subject the statement of this writer in regard to the "only reliable method of investigation known to science." Says the authority: "Minute chemical examination in the most skilled hands has failed as yet to detect any one of the numerous poisons which are absorbed into the system and mingle with and destroy the vital properties of the blood and nervous system. Chemical tests cannot detect animal poisons combined with the milk more readily than they can detect such poisons in the blood, but that they produce their effects when taken into the stomach is as certain as that malarious districts produce ague, or foul, unventilated, crowded dwellings produce typhus."

"If chemical tests fail of showing animal poisons mingled with the milk, the microscope does not thus fail." Pure milk has certain well defined anatomical characteristics which can be discovered when it is placed under a high magnifying power. I have quoted thus largely in this place in order that there may be no misunderstanding upon a subject so momentous. I may say, also, that these statements are supported by numerous authorities in all parts of the civilized world.

My own experiments with the microscope in this direction agree with the authorities in all the main facts.

I have made more than five hundred milk examinations since I commenced this investigation, intending, as far as possible, to meet all points of the inquiry.

In pure, undiseased and clean milk the corpuscles will be found floating freely in the watery solution which forms the bulk of the fluid. They are circular in form and regular in outline.

Milk mechanically, so to speak, appears under the microscope as if made up of innumerable round globules of varying sizes, floating in a clear or slightly yellowish fluid. In bad or diseased milk, in some cases, this fluid is quite blue in color. This fact is alluded to by Fuchs, Steinhof and others.

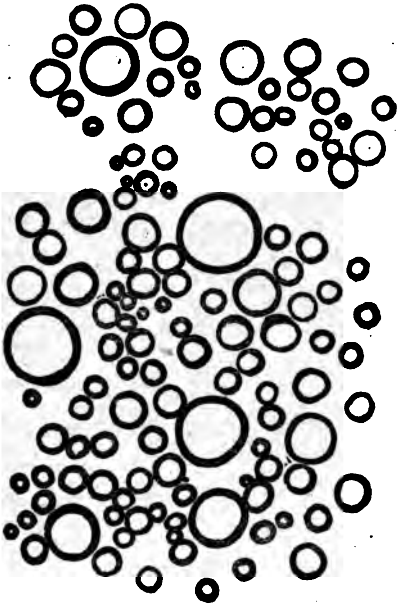


FIG. 3.

HEALTHY MILK.

Figure 3 shows the grouping and forms of healthy milk corpuscles, magnified 340 diameters. The two smaller groups are taken from specimens of watered milk. I do not think that much could be told, as it regards this fact, by the closeness of arrangement or size of the globules. The closeness or thinness of these milk forms depends very much upon the amount of fluid put upon the slide. Their varying size does not seem to be governed by any law; at least such is my experience. This regular-rounded form and freedom of movement of the globules in the fluid in which they are suspended seem to be such constant factors in healthy milk as to justify the statement of many authorites, that any departure from this condition indicates disease. Although I should not be willing to pronounce positively upon this fact as the result of my own experience thus far, still I can say that in all the cases which have come under my observation, where there has been a well marked departure from the normal type, such a conclusion is fully warranted. There is to be observed in milk which is not sticky or ropy on the slide a constant motion, called the Brownnian motion, the globules dancing as if instinct with life. This motion is always present in healthy milk so long as it remains fluid on the slide. In diseased milk I have observed this motion of the globules to cease at once, or fail even to be present, when first placed on the slide under the microscope. The corpuscles would aggregate and stick together in groups or seem to be glued to the slide. This has also occurred in some manufactured milk in which gluten was present. This milk I shall still further allude to in the future.

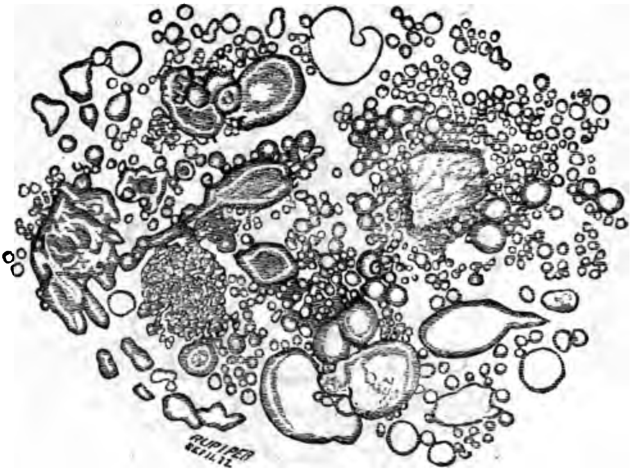


FIG. 4.

Figure 4 is given as a specimen obtained of a dealer on the street. It was quite acid when purchased, about 5 o'clock P. M., showing a tendency to granulation, as seen in the drawing. There were also forms which might have come from water and from special disease in the animal from which it was obtained. Of course I had no means of learning any facts in regard to its history, and can only draw my conclusions by comparing it with other specimens of diseased milk. I think it was made up of new milk and old partly skimmed and watered; the cow swill fed and perhaps rather more than usually diseased. I had not began my quantitative analyses when this was obtained, but have since examined many specimens similar in appearance under the microscope, which have been subject to all these operations.

I have made examinations of the milk of a cow fed on brewers' grains and allowed to go out in a grass lot during the day, and to get also some fresh vegetables. This was taken warm from the cow and put in a clean vial over night, and kept closely corked till morning, when figure 3 was made. Examinations were also made from the fresh milk almost immediately after it was drawn from the cow. The forms in these cases are similar to a series of ten drawings made on ten successive evenings from new milk from a cow fed in like manner on distillery slops. It is impossible to discover any difference in the appearance of the two kinds of milk from the brewer's leavings or the distiller's. I have made, in addition to the ten drawings above alluded to, ten drawings of groups of corpuscles from healthy milk, from ten different specimens, at the same times with those mentioned above. These groups are placed side by side with the others, and the contrast is as marked as between those on figure 3 and the other figures showing diseased milk.

This would seem to settle the fact that with the microscope we can distinguish with absolute certainty between milk produced from normal food and that from the whisky-poisoned leavings of the distillery and the brewery. The cows are undoubtedly whisky-poisoned to a certain extent, from the fact that some portion of the alcohol is left in the debris in both cases, contributing, no doubt, to the bloated, fatty—so-called "healthy"—appearance of the perforce quadruped tipplers. I say perforce, for I am informed that in some cases it is found impossible to compel the poor animal to take the poisoned food. In one case a cow was kept several days without other food or drink, she refusing to the last to touch the still-slops, which were kept in the crib before her. The owner sold her at last from his stables, as he said, solely for this reason. Other animals sometimes show indications of the fact that alcohol remains in brewers' grains. An English gentleman tells me he has seen a large herd of hogs manifest all the various stages of intoxication from eating these grains.

Figure 4 shows the appearance of this last milk after it had stood in a closely-corked vial over night. Here are seen bacteria, fungi, and vibriones, which Professor Tindall describes as "long, eel-like organisms, tossing the globules aside, and wriggling more or less rapidly across the field of the microscope." These organisms, that is the bacteria, he tells us, "are the agents of all putrefaction." Keep them and their germs from your meat (or milk), and it will remain forever sweet.

This last fact, with others of a similar character which have come under my notice during the course of these investigations, is quite remarkable, and furnish grounds for the inquiry whether the germs of these organisms so soon developed may not exist already formed in the milk from these "whisky-sick" cows. This becomes especially significant when we remember that healthy milk taken at the same time in every one of these cows, and kept in the same manner for the purpose of this very comparison, manifested no such changes during the lapse of several days. This early putrefaction has not shown itself in every specimen of swill milk submitted to these conditions, but in a large majority of cases this has been the fact, while in no instance has it appeared thus early in milk from healthy cows. If these seeds, or eggs, all come from without, why did they not germinate in the healthy milk? Perhaps the true answer would be that the soil was better prepared in the one case than in the other. Be this as it may, it is quite evident that there are sources of disease present in these cases which are as subtle in their operations as the germs of typhus or cholera, and surely of much greater importance, as they are more widespread in their operations.

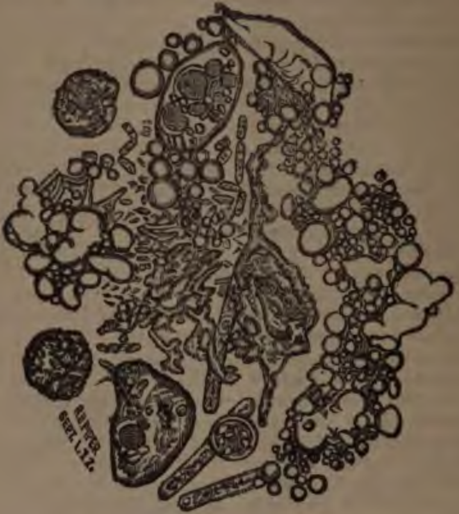


FIG. 5.

Perhaps some of the so-called "granules" in the fresh swill milk may be the spores or germs of these forms, which swarm in it at so early a period after it is drawn from the cow. If this be the fact, with sufficient time and patience we ought to be able to trace their life-history, and thus to come to a safe conclusion in the matter.

DISEASED COWS THAT ARE FAT AND SLEEK.

Since beginning this investigation I have been frequently met with the objection that the "swill-fed" cows (and I mean by this those cows which get a daily allowance of "whisky slops," or "brewers' grains,") show a manifest appearance of health, that they are fat and sleek, and that, therefore, they cannot be diseased, and that their milk cannot be dangerous as human food.

Cases where the flesh of animals fed on certain kinds of food have caused disease and death in the human or other animals which partook of it, are so common as scarcely to need repetition. Thus the flesh of the rufled grouse, or partridge, of this country becomes poisonous when it has been feeding upon the berries of some species of laurel. And yet at these times the bird seems as active and healthy as ever, nor can the keenest eye discover any morbid appearance in its flesh.

There are many other cases recorded where violent disease and death have followed the use of cooked meats, where neither the animal before it was killed, nor the flesh afterward, could be shown to have been in any manner diseased or poisoned. The most careful examination was made in all these cases, both as to the history of the animal, where it was obtainable, and also into the condition and character of the meat, both before and after it was prepared for food.

M. Olliver mentions a case at Paris where a number of persons were rendered seriously ill by eating pork. An investigation was ordered in this instance by the police. MM. Baruel and Olliver, who made the examination in the most thorough manner, could find, however, no traces of any kind of poison in the suspected food.

M. Boutigny also publishes an account of a similar accident, where "a great number of persons were involved at a festival in France." So sure was he of the wholesome nature of the food, after he had made the "most searching examination" of it, that he himself made a dinner of stuffed turkey supplied by the dealer who had furnished the suspected food. "He was seized soon after his meal with chilliness, contracted pulse, cold sweating, lividity of the countenance, great anxiety, and then with vomiting and purging, after which he slowly recovered."

Another similar case is mentioned by Molliner, where six persons were made sick from eating mutton, four of whom died.

It is quite probable that in these cases under the microscope we should have found bacteria, etc., showing as, Christison suggests, "modified putrefaction," as these are precisely the symptoms, with some others seen in those cases of poisoning traceable to the use of putrefying animal matter as food.

It will be remembered in this connection that some individuals are much more susceptible to this species of poisoning than others. While the epicure, fortified by habit, may devour his putrid game with apparent impunity, the neophyte into such mysteries will often be made sick, the illness being manifested by such symptoms as those above described.

To connect these cases more directly with my subject, it will be seen that animal flesh may be rendered poisonous to human beings without there seeming to be any cause apparent to, or ascertainable by, either the chemist or the ordinary observer. This is precisely the case with swill milk. As I cannot doubt that it is poisonous as well as innutritious before it passes into the state of putrefaction, it becomes doubly so when it reaches this condition.

Still further, as it regards the flesh of animals rendered poisonous by certain kinds of food, as in these cases, the flesh of the swill-fed cow may not show in any manner evidence of disease, and yet be injurious when eaten by other animals, and the secretion in form of milk partake of the same nature. The objection is still further urged in regard to these large flocks of swill-fed cows from which so much of the milk used in the city is obtained, that they cannot look so healthy and still give unhealthy milk. And this argument is received by many as sufficient to meet the most stubborn facts in the case, and as the subject is of vital importance it would seem best to pursue it still further. As in those persons rounded into fuller proportions by the daily use of one part of the grain in the form of whisky or beer, the skillful and observant physician very frequently sees evidence of heart-disease or other dangerous malady, so in the cow that gets the other portion of the grain mixed with some whisky, this very same rotundity of form may, and without doubt does, indicate diseased action. The amount of this whisky diet alone consumed each day by a single cow some thirty gallons or more, as I am informed on good authority, would seem to tell the story as truly as the large consumption of milk from these animals tells it in regard to the little patients whose cases I have before described.

That a mere so-called fleshy condition of the body is not to be regarded as indicating good health is very certain.

Boussingault, Dupasquier, Playfair, Thompson, Pozen, and Gasperin, Persos, and others have conducted like experiments upon cows, etc. Boussingault reports that, in his experiments upon cows, he found them losing weight while fed exclusively upon beet root and potatoes.

They ate this food in enormous quantities, as they do when fed upon still slops, and with like disastrous effects—that is, the animal is rendered unhealthy, no matter what may be its external appearance.

As well might one come to the conclusion that the "fair and rosy" arsenic-eaters of Styria were in the enjoyment of the most robust health, as to deduce similar conclusions from the appearance of these swill-fed cows. Dr. Tschudi tells us, in his testimony upon arsenic eating, that it is only the confessional, or the death-bed, that raises the veil from the terrible secret.

A careful and thorough examination into the effects of the use of the various kinds of diseased and sophisticated milk used in our city could not fail to reveal a tale of horror which would show a much greater aggregate of results than was testified to before the Austrian courts as growing out of the use of a well-known poisonous drug.

MANNER OF KEEPING MILK.

There is one important subject connected with this discussion which must not be overlooked. Milk is so susceptible to external agencies after it is drawn from the cow that great care is required in its management if we desire it to be in its normal state when brought into use as food. As milk almost always gives more or less of an acid reaction when received from the dealers, it may be as well, I think, to add a little *pure* super-carbonate of soda to each sample. This, I am told, is done by all the manufacturers of condensed or preserved milk. The kind of vessel, as well as its condition in respect to cleanliness, etc., is also of importance. A family of seven persons in Boston, some years since, were poisoned so that six of them died from using milk which had been allowed to stand over night in a brass kettle. It acts also very readily on lead. Dr. Darwin records a case where "a farmer's daughter was poisoned so that she died from using cream which had been left in leaden cisterns." How many cases of mysterious poisoning may have come from similar causes. It is said (with how much of truth I do not know) that some of the beautiful (so-called) granite ware, as well as some of the old-fashioned glazed ware, is similarly acted upon by milk acids, as also by vegetable and mineral acids.

Milk, like all other animal substances, as we have already seen, may be regarded as more or less dangerous to life and health while going through the putrefactive process; hence the practice of mixing old with new milk should be discontinued, as it only serves to hasten decay in the one without retarding it in the other.

It may be as well, perhaps, also to keep it covered as much as possible, for though we cannot hope to exclude the spores which Professor Tyndall tells us is the cause of this change, still we can keep out many impurities which are constantly floating in the air.

The first or lactic fermentation has been generally regarded by the authorities, I think, as due solely to chemical reaction. Professor Roberts, however, asserts, as I believe, this fermentation is connected with the development of a specific organism, as in case of all the other fermentations.

MILK CONTAMINATED BY IMPURE WATER.

That milk may be the means of spreading disease through its adulteration with impure water is well known. I quote from a recent English authority on the subject:

"There is conclusive evidence to show that most serious consequences have arisen from water polluted with organic matter, e. g., dysentery and diarrhea, malarious fever, and enlargement of the spleen."

"It is also the frequent source of typhoid or enteric fever." "Milk adulterated with polluted water has been the cause of serious outbreaks of fever."

"Water contaminated with the intestinal excreta of fever patients will produce the disease: so also if impregnated with sewage gas. The chief source of the spread of cholera in a community is contaminated water."

In 1873 several children of an eminent physician in London became ill of typhoid fever, and the father attributed the disease to the milk obtained of a certain milk company. At the outset of the disease a list of twenty-three families was published whose inmates were alleged to have been poisoned by milk received from this company. This milk was said to have been contaminated by the water of a certain well on one of the farms where the milk was procured. This allegation seems afterward to have been disproved, and the disease was probably due to the poisonous nature of the milk itself. Two facts are made evident by these cases, that the London physicians agree that fatal diseases may be introduced into the human system through the agency of milk used as food, and that this fluid may be contaminated by polluted water.

That scarlet fever has been carried in milk, Wanklyn says, is "authentic enough," and in the same chapter he says poisonous herbs, fed on by the cows, contaminate the milk, and the same effect may be produced by driving or harassing the animals in any manner. "Hence the importance of attending to the health of milk-giving cows, and to the kind of fodder on which they are fed."

CONDENSED AND PRESERVED MILK.

I have not submitted these preparations as yet to any careful analysis, but from a knowledge of their preparation, should expect the microscope to reveal such spores or fungi as might chance to be present in the milk previous to its undergoing the preserving process. It is very evident that if it should chance to be diseased at the time, it would carry with it such condition in its condensed state. If it were robbed of its proper proportion of nutrient principles through the one-sided method of feeding the cow, no process of the kind could in any manner restore it to a healthy state. Swill milk would be swill milk still, after it had been treated with alkalies, and sugar, and its water evaporated in vacuo.

KOUMISS.

"It is claimed for koumiss," says Wanklyn, "that it presents the caseine in a form specially assimilable by invalids, and that it will sometimes nourish persons whom nothing else will nourish." This, perhaps, is the source of its usefulness in consumption and other tissue wasting diseases.

Whatever may be the true facts in the case, it is quite certain that this new and promising remedy should be prepared from absolutely pure and healthy milk. One instance of the use of koumiss in an apparently hopeless case of consumption which has fallen under my notice seems to promise to fulfill all which is said of its curative powers, and strongly enough to demonstrate the necessity of using other than the viciously organized swill milk in its manufacture. I have also known cases of severe dyspepsia cured by koumiss without the least aid from medicine.

Thus it will be seen that koumiss must be made with proper care in order that it may produce its legitimate results. It may (as we have said above) be so constituted as to produce the very mischief it is intended to cure, and the varying reports which we have of its effects may depend wholly upon the fact that it is made out of diseased, or decomposing, or sophisticated milk, or that an undue proportion of legitimatematerials enter into its composition.

There are, of course, many facts in connection with my subject which I have scarcely touched upon.

The actual physical changes produced by disease furnish a wide field for investigation. Herberger found that "the milk of cows having the murrain had a colostrum-like appearance. This is the fact in regard to every specimen of swill milk which I have examined under the microscope. In febrile affections it becomes very acid, and this, I think, is the fact to a greater or less degree in the milk of swill-fed cows, for it has shown a decided acid reaction in my cases, even when I have received it warm from the cow. Most stall-fed milk shows this to a slight extent in my experience, but not by any means in so marked a manner as that from the first mentioned animals.

MILK ANALYSIS BY MEANS OF INSTRUMENTS OTHER THAN MICROSCOPE.

During the course of my study of milk I have made a series of experiments now extending over several weeks, with reference to testing the question as to how far other methods of investigation could be brought in aid of the microscope, or could be relied upon to the same end where that instrument failed to give full or decisive information.

As is well known, the lactometer and the creamometer have been more or less relied upon to this end, but both of these instruments fail of giving any certain result when used by themselves alone. Thus milk may be robbed of a certain percentage of cream and raised from its normal standard of 1.029 to 1.030 specific gravity to 1.033, 4 or 5, or more, and brought back to this point by the addition of some 12 or 15 per cent. of water, as the case may be, or, as says Wanklyn: "A certain trick of the milk trade in London is fostered by the lactometer. The milk is partially denuded of its cream (accomplished conveniently by adding a certain quantity of skimmed milk to the fresh milk) and thereby raised in gravity. That being accomplished, it is then dosed with water, and its gravity is thereby lowered to the normal standard."

I have examined many specimens of milk that have been partially robbed of cream where but little or no water was added. This can be shown to a certain extent by the lactometer, as can also the fact where water has been used to adulterate milk of ordinary richness. We must bear in mind, however, that exceptionally rich milk may show a low specific gravity, strippings sometimes going as low as 1.020; this being equivalent to the addition of some 30 per cent. of water to good ordinary milk. In milk of this character the milk solids might amount to 20 or 25 per cent., equal in richness to the cream bought of the dealers.

It may be well to remember in this connection that milk consists of water with certain substances suspended in it (fat, milk sugar, caseine and mineral substances) in the proportion of some 87 per cent. of the one to 13 per cent. of the other, so that water in forming into milk receives some 13 per cent. of solids, while the specific gravity is raised only 3 per cent., that is, from 1.000, that of water, to 1.030, that of milk.

The contrast between the effect of mineral substances and organic in this direction is very striking.

A very curious illustration of the value of the lactometer, when relied upon alone, for the detection of milk adulteration, as well as of the wisdom of public boards, not to say health commissions, is given by the London professor: "In a public institution not far from London the authorities are specially particular about their supply of milk. They allow no milk to enter the institution unless it comes up to the M. mark on a certain lactometer. The M. mark is placed very high, and the purveyor reaches the M. mark by skimming the milk."

MILK CONSTANT IN ITS CHARACTER.

In certain respects milk exhibits great constancy of character, as it regards the proportion of milk solids—that is, of fat, lactose, caseine, or mineral matters—and upon this fact rests the value of the method of milk analysis. The fat seems to be the most variable principle, the others remaining quite constant in their proportion, except in cases of certain diseases. Of course this uniformity refers to the general average of milk and not to special cases, or where strippings are submitted for examination.

By the investigations of Alexander Muller and Eisinstuck, made for the Royal Agricultural Society of Sweden, it is shown that the milk given by a herd of cows remained very constant in its composition throughout the year. A daily analysis of the milk from fifteen cows of different breeds, fed alike, gives an average of 12.8 per cent. of milk solids. My tables from three cows give 12.92 per cent.

Now, it will be readily seen that, if the water can by any process be abstracted from a specimen of milk so as to leave the solids in a condition to be weighed, it could be easily ascertained how much water had been added; and if the fat could also be separated from the solids, that we could as readily estimate the amount of cream stolen. This can be accurately done, and upon this fact and the uniformity of the ratio of solids and water in normal milk, Wanklyn's analysis of London milk, sold in the market and furnished the public institutions, is founded. My own method, which of course is based on the same data, is of my own invention, and is a much shorter and simpler process, and, therefore, less liable to error.

For exact quantitative analysis, a graduated pipette should be used; but for ordinary examinations correct graduates will answer. We must also keep in view the liability to error growing out of varying temperature. No possible error of measurement of temperature could occur, however, I think, which would vitiate a quantitative analysis; and this, of course, is the main object of these investigations. And here, as we have seen, the microscope comes in to aid in some directions, and becomes our sole reliance in those of the highest importance.

In very nice calculations of this kind we must, of course, keep in view the difference in weight (specific gravity) between water and milk—a measured volume of the one weighing some three per cent. less than the other.

In some *of my investigations* I have been obliged to resort to chemical tests, in order to explain certain phenomena. In one case milk bought of a dealer gave on three successive days 25, 20 and 18 per cent. of cream, respectively, after standing fifteen hours. I have continued to take milk of this dealer for some weeks since, but no such richness of cream has again occurred. This cream was made up in good part of white glue. It looked very nice and was pleasant to the taste. I have succeeded in imitating it, and find a reason for its manufacture in the fact that it could be made quite profitable. This glue adulteration simulates the appearance of swill milk in some respects under the microscope.

In reviewing what I have here written upon this most important subject, no one can better appreciate than myself how far I have fallen short of doing it full justice. Most of my time has been of necessity taken up with experiments in a field which, if not wholly untrodden, is still without landmarks as to methods of investigation. I have also had to spend a good deal of time in my drawings, a very few only of which I give with this paper. These drawings are the daily records of my labor, and speak in absolutely truthful language which cannot be gainsaid.

As it regards the proportionate amount of adulteration and sophistication of the milk which is sold in this city, I may say that though this fact was not the first object of my investigation, that I have examined but few samples of milk received from the dealers, both in the city and in the districts outside, which have not been in some manner tampered with, and I believe that in this respect we have no reason to consider ourselves better off than the great and honorable city of London. But I must say in this connection that I find no evidence of the sale of swill milk in that city.

I have endeavored to avoid all hasty conclusions, and have not pronounced absolutely in any case, where such a result was not forced upon me by the facts, and also supported by the highest authority. I have certainly not pronounced ex-cathedra in any case, or said a thing was or was not so, "because it was or was not so."

It is evident from these investigations that only such nutriment can permanently support the animal organism in its integrity as contains a due balance of all of the elements of food, albuminates, fats, carbo-hydrates, and certain salts. This has been shown in various experiments upon animals, such as geese dying when fed abundantly on white of egg, and other like experiments, the Paris Academy finding animals perishing from starvation when fed upon gelatin and gelatenous tissue, etc.

Milk in a healthy state contains all these principles, and is, therefore, the typical food, especially for the young animal; and any departure from its normal state makes it more or less unfitted for healthy existence. Swill slops or any other one-sided kind of food renders the milk-producing animal unhealthy, and, not only causes the milk to be unhealthy also, but robs it of some of its essential principles, and thus brings disease and starvation upon the little innocents who are fed upon it. The same effect is to some extent produced by milk watered or impoverished in any manner, which is rendered actually poisonous by being allowed to pass into the putrefactive state. The same may be said of milk exposed to certain external agencies, foul air, etc., or which has been contaminated by polluted water. These conclusions are abundantly proved by the cases which I have described.

The analogy between the amount of swill food consumed by the swill-fed cow and the swill milk used by the sick child is curiously suggestive.

It is also seen by this investigation that no mere appearance of health is sufficient proof of such a state, either in man or animals, and that no one but the most superficial observer would come to such conclusion from such data. One might as well declare that the cases of disease and death which I have described as coming from poisoned meat were due to no such cause, from the fact that the most careful examination failed to find any poison in it, as to say that "fat and sleek" swill-fed, or arsenic-fed cows were healthy from the fact of such appearance, or that the fair and rosy arsenic-eaters of Austria had a right to make such claim for a similar reason.

In regard to the microscopic drawings, I may say that I know them to be all I claim for them, full and reliable records of facts which could be described in no other language; and I can with truth say with the author I have so largely quoted, that without the microscope no reliable examination could be had of the "fearfully poisonous swill milk," and I may add to this that in no case of water adulteration which has come under my notice have I failed to find with the microscope evidence of the fact by the presence of the organisms which are frequently met with in water.

[From the Chicago Times, Dec. 17, 1877. These headings are original with the Times.]

The Diet of Worms—"The Times" Presents Portraits of a Carefully Assorted Collection of Specimens—All of which have Originals in Swill Milk—The Chemist Finds Only Traces of a Solid Substance in the Liquid Abomination—But the Microscopist Discovers a World Densely Populated with Wriggling Fiends—The So-Called Distillery Stables are Simply Hell Holes Reeking with Filth and Pregnant with Disease and Death—Not One-Tenth of Chicago's Lacteal Supply is ever Piped from Healthy Cows—Microscopic Wonderland.

At the request of the *Times* Dr. Piper has again gone over the ground on which he based his opinions as to the influence of a specialized diet of still slops, or brewers' grains, in connection with more or less other food upon the animal economy in producing a state of disease which renders the flesh and milk of the so fed cattle dangerous as articles of human food, and has in this investigation accumulated many additional facts which serve to strenghten his former conclusions. It is to be hoped that the new facts which have come to light during the course of this investigation, together with those which have been presented in former papers, will, in some degree, aid the public in coming to a just conclusion upon the grave question under discussion. Dr. Piper says:

At a recent meeting of a committee of the Common Council of this city, appointed to report upon the subject, it was stated by gentlemen who ought to be authority in the matter that chemistry alone was competent to detect the character of the organic compounds which constitute milk as it regards their effects upon the animal economy when used as food, and that the microscope had no power in this direction.

No chemist who deserves the name will make any pretense that he can distinguish between any organic substances as it regards their effects upon the living animal system through a knowledge of their chemical constituents; how much less can he distinguish between organic and organized bodies by any such means.

Take the long list of the so-called "isomeric bodies" as an illustration. Of the essential oils the following list of fifteen are chemically precisely the same, C.10 H.10, viz.: oils of bergamotte, birch, camomile, caraway, cloves, hops, juniper, lemons, orange, parsley, pepper, savin, tolu thyme and valerian. These oils, as is well known, differ very widely from each other in nearly all of their sensible properties. While some are active poisons, others are useful medicines or pleasant flavors and perfumes. But here, wide as the difference is and far as it is beyond the reach of our chemical science in its present state of development, a still wider difference exists between organic bodies and organized bodies, or "organism in action."

The yeast plant (*torula cerivisiæ*) will furnish an illustration of the point under discussion. "It acts," says Tyndall, "not in virtue of its organic, but in virtue of its organized character." Destroy the cells of yeast by rubbing them on a ground-glass plate, so as to thoroughly destroy the organism, that is, to break up the cells, and though the chemical constituents remain the same, the power to act as a fermenter is totally lost. "Liebeg," the professor goes on to say, "missed this fact, the very kernel of the phenomena of fermentation, by his neglect or want of knowledge of the microscope, and was thus instrumental in propagating an error which has proved an *ignis fatuus* instead of a *pharos* to some of his followers."

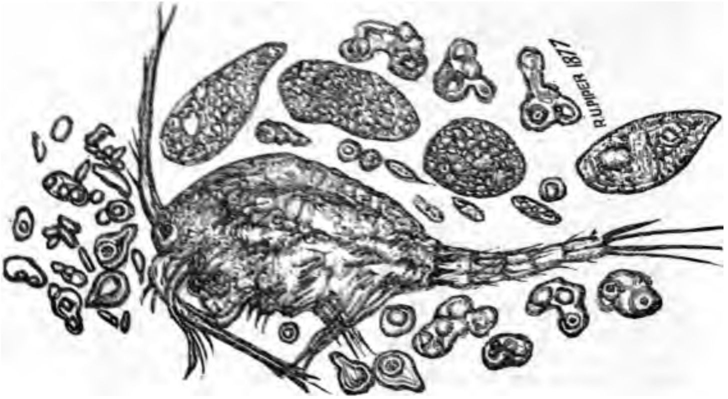


FIG. 1.

In figure 2 I give drawings of the forms found in still slop taken directly and hot from the discharge pipe or spout of the distillery. This swill was kept closely covered in the vessel in which it was received, and first examined before it became quite cold to the touch. At this time distinct appearances of life had begun to manifest themselves, which went on developing until the various forms in the drawing could be seen in untold millions, crowding upon each other often in so dense a mass as to almost shut out the light from the field under the microscope.

Tyndall's description of the organisms found in beer, and the effects produced by them upon the substance, well describes what is but partially seen in my drawing. I quote somewhat largely from the authorities in order to show two facts in this connection. First, that I lay no claim to any originality in the matter; and, second, that those who flippantly deny my facts may know with whom they have to contend in the argument. I only claim to have gone over the ground with the utmost care—to have spent whole days and weeks, even, in study over the microscope; to have recorded my observations in the only way in which they can be made to be of much permanent value—that is, by drawings as well as by written descriptions, and to have endeavored to arrange my facts in such a form as to be accessible to the public. "Beer," says Tyndall (and this includes the remnants of distillation and brewers' grains as well), "is assailable by all the organisms which produce acetic, lactic and butiric acid, while yeast, as well as still slops, etc., is open to the attacks of the bacteria of putrifaction. These ferments have been called 'ferments of disease.' The cells of the true leaven are globules usually somewhat elongated. The other organisms are more or less rod-like or eel-like in shape, some of them being beaded so as to resemble necklaces."

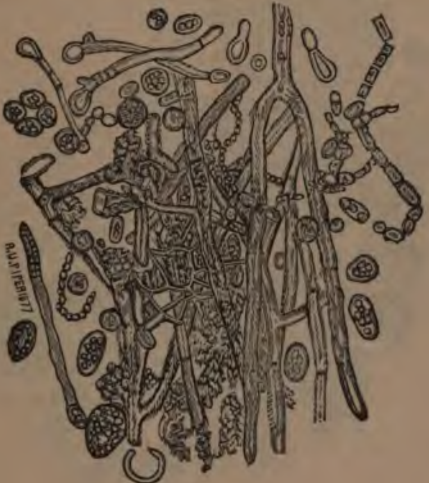


FIG. 2.

It will be remembered that boiling the liquid in which these perfected forms are contained only succeeds in killing them, while their spores or seeds are not only not injured by the process, but are, as I believe, like the seeds of many well-known plants of the higher orders, hurried into life by the process.

There is one curious fact which I notice in this connection, and that is that many of the forms seen in this drawing are precisely the same as those found in the milk which is produced out of such delectable food. Do the spores or some of the minute living forms themselves, even, pass directly through the circulation of the cow into the milk?

That bacteria taken into the stomach may pass from thence into the blood, Dr. Richardson says he has confirmed by actual experiment, and why not from thence into the milk, as is the fact in regard to some other secretions of the animal body? If this is not the case it is difficult to account for some of the phenomena which have come under my notice during these investigations. These phenomena I shall still further allude to in another part of my paper.

I will say here, in passing, that I have found organisms resembling worms in the blood of swill-fed cows, precisely like what I have met with in patients laboring under certain incurable forms of disease. Brauell states that he has observed vibriones in the blood of glandered horses, and M. Davaine, of Paris, has announced the discovery of bacteria in the blood of both man and animals affected with carbuncle and malignant pustule.

I have described these forms as existing in the slops from the whisky still in connection with this investigation for the reason, as I have before stated, that the same forms are found in the milk from swill-fed cows at a very early date after it has been drawn from the udder, and that, too, when it has been kept in closely-stopped bottles. The last example of the kind was obtained three days since, directly from the distillery stables as it was drawn from the cow. Figures 3 and 4 were made from this milk two hours after it was drawn, and 5 from the same milk some twelve or fifteen hours later. In warm weather swill milk shows these forms in from five to ten hours, as will also healthy milk when inoculated with swill milk. At the same time healthy milk was examined, and afterward both samples exposed to the same temperature, side by side with each other. In less than eighteen hours the swill milk had completely coagulated, showing under the microscope the appearance seen in the plate, while that in the other vial showed no such change after the lapse of forty-eight hours. I

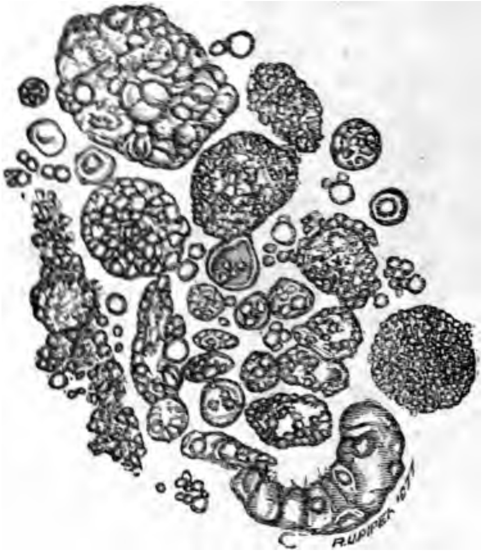


FIG. 3.

have milk kept in a vial made on purpose for the experiment, where one end is drawn to a point like the nozzle of a syringe, so that a drop of milk can be taken out without the chance of anything getting into the instrument from the external air. This milk is more than three months old, and yet there is no appearance of the forms seen in the drawings. This experiment would seem to go far toward establishing the fact of the existence of germs in swill milk at the time when it is drawn from the cow. It certainly shows that they do not so exist in healthy milk. In warm weather the changes described above take place in a much shorter space of time. Some experiments which I made in the inoculation of milk would seem to confirm this view of my subject. In the experiment I took sweet, healthy milk, putting samples in two clean new vials. In one of the samples I introduced a small wire which had been previously wetted with swill milk; the wire was then withdrawn, and the bottles, like the other, closely corked. In some ten hours this milk was found to be swarming with life, while the other had undergone no apparent change. The next day this last milk, though showing a slight acid reaction, exhibited no change which could be seen under the microscope. The changes taking place in the inoculated milk resemble those described by Koch in his experiments with the contagium of splenic fever.

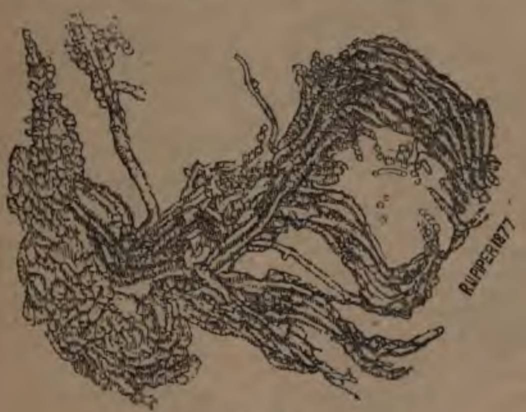


FIG. 4.

As we have seen, the heat of boiling water has no power over the germs of the various organisms we have been studying; so, also, it is quite probable that they are as insensible to the action of agents generally deemed destructive of the so-called lower organisms, as is the fact in regard to *bacillus anthracis*, the parasite which causes the splenic fever. The rod-like or perfected organisms soon lose their vitality, but the germs in all these cases possess great vital power.

In testing this statement, Dr. Koch "dried the blood containing the fully developed spores, and then exposed this substance to a variety of conditions. He permitted the dried blood to assume the form of dust; wetted this dust, allowed it to dry again, permitted it to remain for an indefinite time in the midst of putrefying matter, and subjected it to various other tests. After keeping this spore-charged blood, which had been treated in this fashion for four years, he inoculated a number of mice with it, and found its action as fatal as that of blood fresh from the veins of an animal suffering from splenic fever. There was no single escape from death after inoculation by this deadly contagium. Uncounted millions of these spores are developed in the body of every animal who has died of splenic fever and every spore of these millions is competent to produce the disease."

The spores found in swill milk would seem to be quite as persistent as those producing splenic fever. Neither scalding, nor freezing, nor drying, nor lapse of time seems to have the slightest effect upon their vitality. There is one other argument which tends to confirm the idea that the germs of bacteria and other like organisms found in swill milk have their origin in the body of the animal which produces it. This is the fact that in all those cases which I have observed in which the milk was submitted to the scalding process.

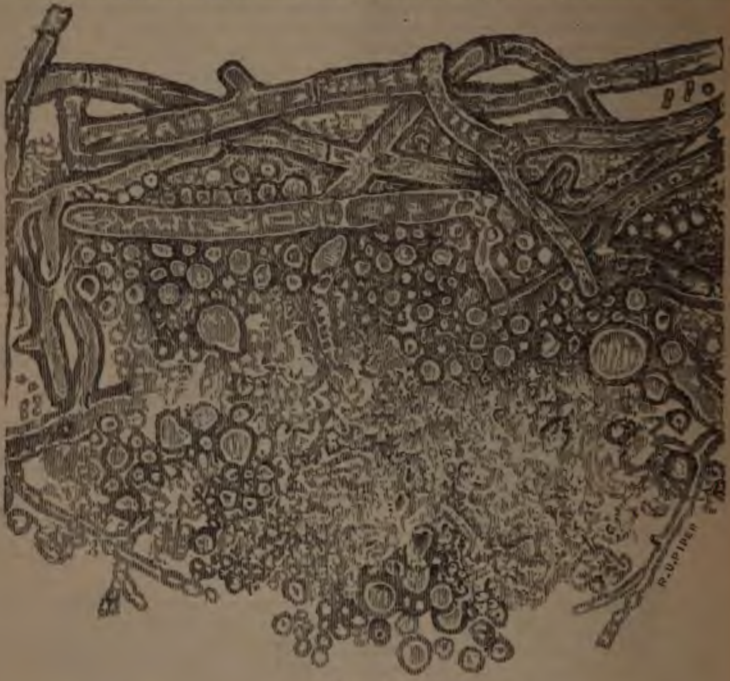


FIG. 5.

Putrefaction has been hurried by the operation, while the contrary is known to be the fact in the case of healthy milk.

Should it be proved, however, that these germs are introduced from without, still it is absolutely certain that swill milk does become putrid much quicker than healthy milk, thus showing that it is very early prepared by some inherent vice of composition for such a result.

That putrefying, bacteria-laden milk will bring on fatal diseases of the bowels in children, does not admit of a question, and here is the source of the sudden accession of this class of diseases after a few hot days and nights in the summer season, and also of the as sudden decrease in these cases after a few cool days and nights. Healthy milk inoculated with the minutest number of spores possible, I have never known to keep through a single summer's night, though placed directly on ice. And this experiment I have seen repeated a great number of times.

That milk may be so poisoned by the food or drink of animals producing it as to spread certain specific diseases, such as typhoid fever and scarlet fever, is an admitted fact. Indeed, eminent physicians say that such milk is capable of originating some of this class of diseases. In 1873 several children of an eminent London physician were taken ill of typhoid fever. Their father attributed the disease to the milk used in the family. What is to hinder a widespread infection of a similar nature from breaking out in our city, where at least one-third of the milk used is obtained from animals whose drink, and very food even, is crowded with uncounted millions of the germs of putrefaction, and also, perhaps, with those of disease whose causes cannot, in the present state of our knowledge, be even guessed at?

There is another important point of view in this connection from which this subject should be considered. Many eminent physicians regard most of the phenomena of a large number of diseases to which we are subject as being dependent upon vices of nutrition, if we are not warranted in attributing their origin to the same parentage. Thus, by consuming impure, unwholesome and unassimilable food and drink, we prepare our bodies as the cultivator prepares the soil, for the reception of the seeds of most kinds of disease which need only to be planted in the enriched soil to bring forth an abundant harvest. Or, as says Prof. Tyndall, "If you sow small-pox in the human body, your crop is small-pox. Sow there scarlatina and your crop is scarlatina. Sow typhoid virus, your crop is typhoid; cholera, and your crop is cholera," etc. Whatever ground we may take as it regards the germ theory of disease, there can be no question as to the fact that whatever of regimen or habit tends to debilitate the system renders us more liable to its attacks, and less able to resist these attacks when we chance to become the subjects of them. I give here a summarized description of my plates or drawings.

Figure 1. From water taken from a goose pond in an inclosure where some eighty cows have been kept during the past season. The cyclops, the largest form in this plate, belongs to the order Polyphemidæ. They are found in large numbers in this water, where, perhaps, their office is to act as scavengers by devouring the lesser and more numerous forms. If this be their office, however, they fail very much in its execution, as the varied organisms move in untold numbers all about their giant neighbors, who do not, that I have observed, like their one-eyed namesake, ever prey upon their weaker companions. The other forms in this plate are amœbæ, bacteria, monads, and the products and cause of corruption; and in the midst of this reeking mass of alternate production and decay of animal ordure and vegetable rottenness these eighty cows have been pastured, have drunk of this water, and have been fed with their abominable, ill-smelling food, and the produce of such a regimen in the form of milk have been distributed to the people of Chicago.

Figure 2 shows the forms found in the still slops themselves, most of them so like those seen in swill milk that this plate, leaving out the monads and amœbæ, would present the same appearance as seen in putrefying milk. If we dry this swill to powder, either in a hot or cold atmosphere, and afterward put this powder in water, in a very short space of time the miracle of life is renewed and the swarming millions of minute organisms are again seen; some of them moving with wonderful activity in every direction across the field of the microscope, while others, as the amœbæ, crawl with tortoise-like pace, actually changing their forms with every motion. "Here, indeed, under the microscope," as says Alphonse Karr, "is the true wonderland—the land of faerie."

Figure 3 and 4 show the forms found in the fresh swill milk taken directly as it was drawn from the cows in the distillery stables. In this plate are seen drawings of two active, living forms, which I found in the warm milk; but these, I think, were introduced from without. There is also a grub-like form in this plate, which, without doubt, belonged to the milk itself. This plate, together with plate 4, shows the forms with which this milk was literally filled; these forms actually taking up more ground under the microscope than the milk globules themselves. When we remember that "milk is more or less diseased as it departs from its normal, anatomical characteristics," we shall realize the condition in which all swill milk is involved. The few groups of circular forms seen in the plates show the healthy anatomical form.

Figure 5. This figure exhibits the appearance of putrid milk as seen under the microscope. The description of the contagium of splenic fever, in its development, given in a former part of this article, would serve to describe the fungoid forms in this drawing. There are, in addition to these, bacteria, vibriones, and other organisms found in putrefying animal matter—forms which, I believe, and am fully warranted in saying, could be shown under the microscope to exist in a greater or less degree in more than one-half of the milk sold in this market in the summer season. R. U. PIPER.

The following is the *Chicago Times'* own report upon the subject under consideration. Every one who has traveled over the same ground will testify to the absolute fairness of the whole narrative:

The Dens of Disease.

The distilleries of Chicago are not located so as to be easily or pleasantly accessible. They are not near the business centre of the city, and the atmosphere around them is not conducive to paved streets or sidewalks. These localities are not always indicated by the directory. But the officials of the internal revenue office can inform the inquirer precisely where they are, and with plenty of time, high and tight boots, and well-reefed pantaloons, they may be reached. These distilleries are interesting affairs. From them proceeds the nourishment of infancy, the stimulus of manhood, and the revenue of the government. From them also proceed other things, such as corned beef and corned humanity. In the former case the beef is furnished to be corned elsewhere. In the latter case the supply comes from other sources and the distilleries do the corning. There is a general understanding that no one fountain is able to send forth sweet and bitter water, but from the wonderful distillery proceed both gin and milk. Thus does the distillery minister alike to old and young, and it is a question yet to be decided whether the gin or the milk is the more fatal in its effects. It cannot be decided till the experiment is tried of keeping adults on a steady diet of the milk, and feeding babies exclusively on gin.

It is pretty well known that at the distilleries the substance known as "mash," frequently called by the yet more appetizing term of "sour-mash," is placed in the copper retort and worm and a part of it comes out highwines. It is a fact not so generally known that the part of the mash which does not become highwines is then placed in another apparatus, not of copper, but containing parts closely resembling retorts and worms, an apparatus colloquially known as a cow, and a considerable portion of it issues in the form of milk. That which does not become milk, may, by judicious application to the soil, become corn and rye, to be in turn converted into mash, to be fed first to the copper retort and afterward to the cow, and thus does the economy of nature and art become manifest.

The business of making milk and beef out of the waste mash is carried on in this city, as elsewhere, on a large scale. The results in the case of milk are given by Prof. Piper, illustrated with cuts, with which it would be well for the numerous dealers in distillery milk to decorate their wagons. They might give chromos of the entire set to their largest customers. There are many ways in which, by distributing these interesting pictures, the dealers in gin milk might promote the public good—and augment the increase of their rivals, the dealers in country milk.

At the six distilleries now in operation in the city, there are nearly twenty-five hundred cows and about eighteen hundred steers and bulls. This gives only a partial idea of the total number of cattle being fed on slops, because the slops are carried away in wagons to a very large extent, and fed to cattle in stables of two, ten, twenty, and fifty, tucked away in obscure alleys all over the city.

These cattle are kept in sheds adjoining the "slop-yard" of the distillery. The walls are generally between five and six feet high. At the distillery of H. H. Shufeldt & Co. they are considerably higher. At the West Chicago alcohol works they are lower—about the height of the cattle. The roof rises enough to give it a good pitch. The sheds are placed side by side, with no partitions between them, so that from the outside a stable appears to consist of five, ten, or fifteen sheds, but inside it is simply one stable. Through the middle of the shed runs a passage three or four feet wide, for the convenience of the stable men. On each side of this passage is a row of cattle standing, with their heads to the centre. In front of each row of cattle is a trough running the entire length of the shed. The slops are let into one end of the trough by a gate from a sluice running to the distillery. At the other end of the trough is a gate, by means of which the slops not eaten, or, more properly speaking, drank, are emptied.

The cattle are chained to poles. They are never bedded down, and of course the floor is constantly soaked with liquid manure, and when the cattle lie down they rest only on the wet boards.

A good deal of slops and hay falls into the passage between the heads of two rows of cattle. This passage is cleaned out several times a day with "squeegees," but it is never dry, and is often very slippery with slops.

At this season of the year the cattle have not been in the stable long enough to show the real effects of slop feeding. None of those that were examined had sores, or manifested any want of appetite. All the stablemen declared that the animals appeared better in the spring than in the fall. None of them had observed any detriment to the teeth from eating slops. Some of them presumed that if cows were kept on slops for a couple of years their teeth would become softened to such an extent as to disable them from eating hay. A gentleman connected with the firm of H. H. Shufeldt & Co. admitted that a steady diet of slops for two years would ruin a cow's teeth, but he was decidedly of the opinion that no bad results followed from feeding part slops and part hay for six months.

If slops, according to the confession of interested persons, will ruin the bony structure of an animal, the last part of the body to be affected by disease, in two years, it is hardly necessary to ask whether it is wholesome food for six months. Of course it cannot be. But as a matter of fact, many of these cattle get slops much more than six months, for in summer the slops are carried to the private stables where they are kept. Of course it would be bad economy to keep cows on slops till they were ruined, and so the practice is to turn them into beef before this point is reached, and milk a new set of animals. The beef is unquestionably bad. The flesh of animals whose bony structure is undergoing decay, and whose milk contains pus globules, highly poisonous, is manifestly unfit for food. But the quality of the meat is not merely a matter of inference. On being questioned about the meat of swill-fed cattle a butcher replied that he could not handle it at all. It putrefied before it had hung long enough to be fit to sell. In this respect the beef closely resembles the milk, which putrefies within a few hours after milking. The meat is packed soon after being killed and becomes mess beef.

If the cattle are perfectly healthy when kept in these stables they must have singular constitutions. The stables have been credited with a reasonable degree of cleanliness, but this is not the only point to be considered. The cattle are put in in October and stay till April or May, six months being the usual period of their incarceration. During this period they are never taken out. They never get a breath of decently fresh air.. They are never watered. They quench their thirst only with the steaming slops, containing various impurities, besides a considerable amount of alcohol. A distiller feels abundantly satisfied if he gets from a given amount of grain three-fourths of the alcohol that chemistry says it contains. To be more precise, a bushel of grain ought to yield twenty-two quarts of spirit, but the best process at present known extracts only sixteen.

The roofs of the sheds would not seem particularly low if but few cattle were kept under them. But when five hundred or a thousand or fifteen hundred cattle are kept under one low roof, it is quite another matter. There are no windows. There is a door at each end of each of the passages spoken of, the passages in front of and behind the cattle, but these doors are small and are closed nearly all the time. There are a few holes in every roof. Whether these are evidences of decay or are intended as ventilators is uncertain. If the latter is the case, they are utterly inadequate. In such a confined space as this hundreds of cattle are constantly breathing and rebreathing the air.

Long, shallow trenches, most of the time full of semi-fluid ordure, pollute the atmosphere. Four times a day the feed-troughs are filled with steaming and odoriferous slops to render what, by courtesy, is called air, yet more hot and impure. These foul odors are apparent to an almost nauseating extent for some distance from the stables.

Where steers and bulls are kept they belong to the distiller, sometimes to a stock-raiser, and are being fatted for the market. The milch cows belong in lots of various numbers to milkmen who get their animals boarded at the distilleries during the winter. For a sum agreed on, the distillers furnish all the slops the cows will eat, and the owners give as much hay as they feel like affording, the amount varying with different owners. Generally the animals that are being fatted get more hay than the others. It takes the animals from three to six weeks to learn to eat slops. Some will take to the new food more readily. Others will never touch it. One cow, a devoted Good Templar, went without food and water three days and three nights rather than touch her portion of alcoholic beverage. Her owner gave up and sold her. Another tetotaler went on short rations of hay for months rather than eke out her fare with slops, and at last she also was sold. At first the animals have to get a good deal of hay and very little slops. Day by day the hay ration is reduced in proportion as the animals become reconciled to their spoon-victuals. They refuse to eat it very hot, and let it stand before them and cool until the temperature suits them.

The evils of swill milk fall the most heavily on those who can the least resist the effects of bad food—the babies. When a baby makes its appearance, it is generally found necessary to supplement the supply of food provided by nature.

At the Garden City distillery there are eight hundred steers being fatted for beef. The *Times*' investigator visited the two stables in which these animals are kept, a little after four o'clock in the afternoon. The work of shutting up for the night had begun. Both the stables were entered at several places and the visitor proceeded as far down each passage as seemed consistent with life, liberty, and the future pursuit of happiness. The state of the atmosphere was frightful beyond description. The temperature was too high. The animal warmth was enough to account for this without considering the effect of the supper of slops. The foul breath of four hundred cattle in each of those low and tightly-covered stables, the steam from the trough of slops, and the effluvia from the manure, all combined to make the place seem a very Black Hole of Calcutta. There were no windows, and all the doors were closed. There was no way for the fresh air to get in or for foul air to get out, except through a few insignificant knot-holes, and some small spaces in the roof where boards appeared to have been misplaced. The heat and the impurity gave the air a feeling of density that must be experienced to be appreciated. Walking in these stables seemed like wading through something not so thick as water, but a good deal thicker than air. This was the state of things before five o'clock in the afternoon. What could the atmosphere of those stables have been by the next morning?

The air is equally bad in stables where cows are kept, and though less bad by day than by night, it is at best suffocating with heat and poisonous exhalations. Whether the cows like foul air or not isn't material. It is impossible for animals to breathe such air and be healthy, whatever their external appearance may be. There is another and a very important point that must not be overlooked. Milk is one of the most ready absorbents of impurities that is known. Milk that stood only a short time in a room where there had been a typhoid-fever patient has been the vehicle of contagion. Sanitary records prove that typhoid fever in a milkman's family has been communicated to persons at a distance simply by the instrumentality of the milk, which, by standing only a short time in the house, absorbed the germs of disease. The air of these stables is loaded with the exhalations of decaying animal and vegetable matter, and of the deposits of animals whose meat and milk, and, at last, whose bones give evidence of an unhealthy condition. All these matters stand in a warm, dark place, the conditions being the most favorable known to scientific men for promoting putrefaction. Exposed even for a little time to such an atmosphere, the best milk in the world would absorb poisonous germs.

At the stables of the Garden City distillery the cattle get a little hay three times a day. They get slops three or four times a day; all they can eat. One of the stablemen was asked if they would eat a barrel of slop a day each. "Oh, sure," was his reply. Men at other stables said the animals would eat a barrel a day or more.

At Charles Wachsmuth's distillery the price of a day's ration of slops for a cow and the price of a barrel of slops are the same.

At the Phenix distillery, Clybourne place bridge, north of the rolling mills, are fifteen hundred cows in one immense stable. In respect to height and other particulars, the stable corresponds to the general description already given. It was visited early in the afternoon, when there were many stablemen and milkmen and women in the stables, and many of the doors were open. Still the heat was excessive and the odors foul and almost overpowering.

At Charles Wachsmuth's distillery, corner of Elston road and Blackhawk street, are five hundred cows. The distillery gives them all the slops they will eat, for eight cents a day each.

At the West Chicago alcohol works on Kinzie street, a little west of Western avenue, there are two hundred cows and about a hundred and thirty steers. The stable is substantially like those already described, but the roof is a little lower, and the stable is a little darker. The passages in front of and behind the cattle are narrower than in some other stables. The slop-troughs are scraped out after each feeding. The cattle get two loads of hay, a little over two tons on an average per diem, giving the animals about thirteen pounds of hay a day each, being "all they want," according to the stablemen. In other respects the condition of the cattle and stables here is substantially the same as at other distilleries.

The amount of milk given by slop-fed cows is not large; at least at present. The estimates of different milkmen at all the stables were obtained, and they agreed closely. The average is seven or eight quarts a day. "Not any over seven quarts," one man said. "Six, seven, and eight quarts," said another. Occasionally there is a cow that will give fifteen quarts, but it is an exceptionally good one that gives ten or twelve. A good many give only four, five, or six each. The testimony of persons qualified to judge is, however, that after the cows get accustomed to eat the slops, and eat them readily, the yield of milk will average twelve quarts or more.

The cost of milk from slop-fed cows, including hay and slops, does not exceed two cents a quart, and is frequently a great deal less. Country milk costs the dealers four cents a quart, and they must charge enough more to pay their expenses and give them a profit.

Dealers in country milk complain justly of the ruinous competition between them and dealers in distillery milk. Of course the latter can undersell. A large dealer in country milk, a man who has been in the business here for twelve years, and has a large route, told a reporter of the *Times* that he could make twenty dollars a day clear additional profit by substituting distillery for country milk.

The work of milking is going on in the distillery stables at all hours of the day. The appearance of the men and women who do the milking is not prepossessing. Of course, no effort is made to pollute the milk, and the milk is strained when poured from the pail into the can, but the same hands that do the milking have to handle the cows a good deal. The cows stand pretty close, and the milker has to do considerable pushing and slapping, especially on the soiled parts of the animal's body, to make room for himself. Of course the only way to get at the cows is by way of the passage in rear of them, and this is frequently a canal of liquid manure several inches deep. Through this the men and the bloomer, but not blooming, women saunter with their milk-pails, with an air of easy indifference that the most accomplished leaders of society could not equal under similar circumstances. Sometimes an animal gets loose and creates a spattering that compels the milkers to seize their pails and fly for refuge. That a substance less fluid than milk has been known to get into the pails is undoubtedly true. It is not at all likely that it is common. So far as the *Times* investigator was able to observe, reasonable precautions were taken in milking, but the people who milk are not the people who esteem cleanliness next to godliness, or, if they do, they put no very high value on godliness.

The number of cows fed on slops away from the distillery can only be roughly estimated. The six distilleries now in operation in this city consume about 165,000 bushels of grain monthly. To each bushel of grain is added forty-five gallons of water, making fifty-three gallons of mash. From this four gallons of spirits are obtained. Allowing nine gallons of waste, there would remain forty gallons of slops for every bushel of grain, the slops consisting of about four-fifths liquid and one-fifth solid matter. Allowing twenty-eight gallons to the barrel, this gives monthly 235,773 barrels, or daily, 7,859. Allowing each animal a daily ration of one barrel, would indicate that over 3,500 animals are fed on swill away from the distillery stables, these stables being known to contain about 4,300.

As has already been said, in the distillery stables are nearly 2,500 cows and some 1,800 steers. In these private stables, however, nearly all the cattle, just estimated at over 3,500, are cows. It is safe to set them all down as milch cows, as the number of animals in the private stables that are being fatted, if any, are too inconsiderable to affect the calculation.

The private stables are kept in a condition hardly as good as the distillery stables. In them there are not so many cattle under one roof, but the cattle are more closely placed, and less pains are taken to keep the floors and animals clean. In the distillery stables the cows remain only six months in the year. In the private stables they remain as long as the owner thinks it is profitable to keep them.

Near the corner of Chicago and Western avenues is a private stable of some seventy cows. They were kept on swill during the summer. The hot weather rendering it necessary to water them, they were allowed to quench their thirst in a stagnant pool of the most filthy condition. The pool caught every kind of refuse, of which oyster cans were the least objectionable. Geese crowded the hole and polluted the water which, even without them, would have been unfit for any animal to drink. Such was the water that, through the animal economy, entered into the composition of the milk served to Westsiders.

Six thousand cows would give the city from twelve to eighteen thousand gallons, according to different estimates, of unwholesome milk. Some addition is received from the distillery at Riverdale, twenty miles from here, where several hundred cattle are kept. Two more distilleries are about to resume business and augment the supply of slops.

Experts object to the milk of animals fed on brewers' grains more than that of cows fed on slops. Brewers' grains contain more alcohol than slops do. As there are no stables in connection with the breweries, information on this topic is not easy to get. The brewers of this city dispose of sixty thousand bushels of grains every month, and all this vast quantity of unwholesome food is carried from the breweries to little stables all over the city and are fed to cattle, mostly milch cows. This is the source of another vast supply of diseased milk.

A country milkman of long and large experience in this city gave a *Times* reporter as his estimate that of all the milk sold in this city forty per cent. is from cattle fed on slops and brewers' grains, fifty per cent. is country milk adulterated to enable the dealer to compete with the swill milkmen, and ten per cent. is pure country milk.

Even the distillery milk is adulterated, but whether this improves it or not is not quite certain. Distillery milk is not deficient in cream. By skimming it, adding water to the cream and water plus other ingredients to the milk, a white fluid is obtained which can be sold with a large profit for three cents a quart, and it is bought by poor people.

Swill milk is outlawed in New York and St. Louis. An attempt was made in this city some time ago to get an ordinance passed making it criminal to deal in the stuff, but the distillery influence was too strong in the city council, and the effort failed. The profits of distilling depend largely on the ability to sell the slops.

The New York law is as follows. It is enforced in New York city by the board of health, with the help of two police inspectors:

CHAPTER 544.

An Act to amend chapter 467 of the laws of 1862, entitled "An act to prevent the adulteration of milk, and prevent the traffic in impure and unwholesome milk."

Passed May 2, 1864; three-fifths being present.

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

SECTION 1. Section 1 of chapter 467 of the act entitled "An act to prevent the adulteration of milk, and prevent the traffic in impure and unwholesome milk," passed April 23, 1862, is hereby amended so as to read as follows: Any person or persons who shall knowingly sell or exchange or expose for sale or exchange any impure, adulterated, or unwholesome milk, shall be deemed guilty of a misdemeanor, and on conviction thereof shall be punished by a fine of not less than fifty dollars for each and every offense; and if the fine is not paid, shall be imprisoned for not less than thirty days in the penitentiary or county jail, or until said fine shall be paid.

SEC. 2. Any person who shall adulterate milk, with the view of offering the same for sale or exchange, or shall keep cows for the production of milk for market, or for sale or exchange, in a crowded and unhealthy condition, or feed the same on food that produces impure, diseased, or unwholesome milk, shall be deemed guilty of a misdemeanor, and on conviction shall be punished by a fine of not less than fifty dollars for each and every offense; and if the fine is not paid, shall be imprisoned for not less than thirty days in the penitentiary or county jail, or until said fine shall be paid.

SEC. 3. Any person or persons who shall, in any of the cities of this State, engage in or carry on the sale, exchange or any traffic in milk, shall have each and every can in which the milk is carried or exposed for sale or exchange, and the carriage or vehicle from which the same is vended, conspicuously marked with his, her, or their names, also indicating by said mark the locality from which said milk is obtained or produced; and for every neglect of such marking, the person or persons so neglecting shall be subject to the penalties expressed in the foregoing sections of this act; but for every violation of this act, by so marking said cans, carriage or vehicle as to convey the idea that said milk is produced or procured from a different locality than it really is, the person or persons so offending shall be subject to a fine of one hundred dollars or imprisoned in the penitentiary or county jail, or both, in the discretion of the court.

SEC. 4. The addition of water or any substance *other than a sufficient quantity of ice to preserve the milk while on transportation to market*, is hereby declared an adulteration. Any milk that is obtained from animals fed on distillery waste, usually called "swill," or upon any substance in a state of putrefaction or fermentation, is hereby declared to be impure and unwholesome.

SEC. 5. This act shall take effect immediately.

This is the law which the country milk-dealers here have tried to get passed, omitting the italicized words.

In his speech in the Munn trial in this city, Robert G. Ingersoll said: "I believe, gentlemen, that alcohol, to a certain degree, demoralizes those who make it, those who sell it, and those who drink it. I believe that from the time it issues from the coiled and poisoned worm of the distillery until it empties into the hell of crime, dishonor, and death, it demoralizes everybody that touches it from its source to its ends. I do not believe that anybody can contemplate the subject without becoming prejudiced against that liquid crime. All we have to do, gentlemen, is to think of the wrecks upon either bank of this stream of death—of the suicides—of the insanity—of the poverty—of the ignorance—of the destitution—of the little children tugging at the faded dresses of weeping and despairing wives asking for bread—of the men of genius it has wrecked—of the millions struggling with imaginary serpents produced by this devilish thing; and when you think of the jails, of the almshouses, of the asylums, of the prisons, and of scaffolds upon either bank, I do not wonder that every thoughtful man is prejudiced against that damned stuft called alcohol."

In this he referred only to alcoholic drinks other than milk. He might have been no less eloquent had he been denouncing that other "stream of death" that flows from distilleries,—diseased milk. The graves of the innocents that crowd the banks of this stream might well inspire as pathetic eloquence as was ever uttered.

The Great Baby-Killer.

By special request of the *Sunday Times*, Dr. J. E. Gilman, who has given the subject of swill milk much attention, both in the laboratory and in connection with his daily practice, has prepared a brief statement which is herewith submitted:

The necessity for a pure food for infants is too apparent to need any argument. The stomach is an organ that will bear abuse with a Christian meekness, but its practice will end, sooner or later, with an outburst of righteous indignation that is often fatal in its results. I have tested, during the last six months, the character and quality of many different samples of milk, and have noted the effect on infantile life and health, of the milk produced from grass, hay, and grain-fed cows as compared with that from animals using almost entirely the refuse of breweries and distilleries. From the data thus derived, I am fully convinced that no more dangerous enemy exists to infantile life than lurks in the can of swill-fed milk.

It is an established fact that the condition of decomposition, by contact, may be propagated to constituents of the living body, and if the food is in a stage of putrefaction, a condition of decay will be induced similar to that at work in the molecules of the putrid matter. Now, the milk received from the animals fed on swill is more or less loaded with pus corpuscles, and other evidences of its unhealthy origin, according to the longer or shorter time that the animal has fed upon the refuse grains, and the proportion in which they have been used. This the microscope exhibits, and the evidence is unmistakable, to my mind, that after a period of feeding with distillers' swill, where this is the sole food of the cow, the milk contains those elements of decomposition that are the seeds of death to the hapless infants.

In the samples of milk examined there was one thing quite noticeable, namely: The difference in the keeping qualities of the two. Country milk would remain sweet for twenty-four hours longer than the other, and when sour would give a clear acid odor. Swill milk, on the contrary, would often sour on the day it was milked, and the odor would be foul and nauseating, even before acidity was apparent. This characteristic has been the cause of complaint repeatedly from families where I attend. Not knowing the reason of the odor, a mother would say, "The milk spoils so quickly and it smelt so badly I could not give it to the baby." This report was always received with inward satisfaction, on my part, that the baby was fortunate in having a mother blessed with the sense of taste and smell, and with judgment good enough not to force into the stomach of a helpless infant food that would turn that of an adult.

Sour milk will occasion irritation of the stomach, bowels, and mesenteric glands (the glands that carry the food from the intestines), and eventuate in inflammation, acute or chronic. This is the condition known as gastric irritability, lighting up into inflammation of the stomach, cholera infantum, dysentery, consumption of the bowels, or other kindred troubles, as the chance may be. Now if to sour milk — one dose of which may make an inflamed condition — you superadd putrefaction and continue this course of diet, a once healthy child, though it had the digestion of an ostrich, must finally succumb. I fully believe it is but a question of time and quantity of the supply of the unclean thing to out-Herod Herod, and sweep out of existence whole families of nurselings, instead of the first-born only. Look at the process: The food passes from the stomach to the duodenum and the small intestine. Through this course it is mixed with the fluids that prepare it for absorption. The membrane lining this portion of the alimentary canal is liberally endowed with small ducts or tubes that suck up such portions of the materials as can be absorbed. Pure food will make good blood, and these canals retain their healthy condition. An irritant in the food excites congestion, and the capillaries are unable to fulfill their duties as before. Congestion often repeated brings a grade of inflammation, in which case one after another of the tubes may cease work entirely, until that condition known as atrophy or marasmus is induced, the food passing through the intestine as it would through a rubber tube. This condition, if the infant survive long enough to reach it, is absolutely certain to come with the average babe, if the milk such as I have had repeated samples of in my office, be used steadily for its diet. In addition to the danger from acidity, there is the ever-present œplic poison waiting but the weakening of the vital force to make its deadly onslaught. And at the end the pastor will sweetly say, "The Lord gave and the Lord taketh away; blessed be the name of the Lord"; and the sorrow remains in the desolated household, but the milkman has profited one or two cents on the quart, and is rejoiced. I have seen case after case where the change of milk has made the difference of health or disease. The history of one case is the same as another in its general results, only modified by its surroundings, as the history of one case of arsenical poisoning bears resemblance to another. For instance, on Lake street I had a patient, a little child, suffering from that aggregation of troubles known as teething. The sickness began three days after a change of the source of milk supply. On the increase of bad symptoms, a change of diet was recommended, the milk being derived from a cow fed on grass and bran, and immediate improvement was the result. A little later on, fresh symptoms of mal-nutrition appeared. An investigation proved that the trouble made its appearance after a few days' use of swill milk. A change to pure milk at once removed the disease. Here was a case that would have ended with a brain inflammation had swill milk been continued.

I know one child of the age of four years, with the appearance and acquirements of but two, whose only safety has been a tenacity of a hold on life such as is rarely found in children. His years of suffering were largely due to swill, and his stomach will at once reject milk of any kind in consequence. I have in memory the painful death of two children nourished (?) by milk from one cow fed on brewers' grains. These children were in different families, and were slowly poisoned to death. These cases could be multiplied to a fearful extent, were the springs that stay the fatal disease exposed, and the verdict would be "Died of swill milk," instead of "By a dispensation of Providence." In the State of New York the sale of this milk is prohibited by statute, and the board of health would lessen its mortuary statistics were the law transferred to our own commonwealth.

[From the Chicago Times, Jan. 8, 1878. These headings are original with the Times.]

Blood will Tell—The Question is, Is the Flesh of Swill Fed Cattle a Fit Article for Human Food?—Their Bony Tissues are so Badly Diseased that their Tails Drop Off—Science Shows that the Blood of the Swill-Sick Cow is Strikingly Like that of the Syphilitic Human—And it also Resembles that of the Confirmed Whisky-Bloat on his Last Legs—These Facts are Plainly Set Forth by a Series of Illustrations.

The publication in the *Times*, some weeks ago, of an illustrated article on swill milk has elicited many compliments from the highest sources, and cannot fail to benefit, not only this community, but the civilized world. In this article was definitely foreshadowed a second, showing the effect of distillery slops upon the flesh of the living animal. In other words, the subject upon which Dr. R. U. Piper has been requested to prepare this article is swill-fed beef, and the revelations he has made in pursuing his investigations are not less startling than were those in regard to swill milk. The doctor writes:

On my recent appearance before a committee of the Common Council charged with the examination of the question of the effects of distillery slops and brewers' grains in their operation upon the animal organism of the bovine family, in the production of milk, and also in the development of the flesh as an article of food, I was asked whether I could furnish facts showing the unwholesome or poisonous nature of the beef thus produced, as I had claimed to do in respect to milk. In reply I stated that so far as I was informed, the flesh of these animals was in all cases more or less diseased, and that the answer would lie in the fact whether diseased flesh was suitable for human food, and the proofs would seem to be wholly on the negative side of the question.

The political writer Junius, somewhere remarks that "when the safety of a nation is at stake suspicion alone is a just ground for inquiry;" so w health and lives of a whole city full of people are at stake, it would se just to weigh the matter carefully before coming to a conclusion. On t side are the half million inhabitants of the city; on the other a compar few individuals whose sole object and interest in the case would seem to increase their gains, no matter how much suffering and sorrow to other be involved in the process.

DISEASED MEAT NOT WHOLESOME.

Christison, in his work on poisons, says: "Game, or other meat, decayed enough to please the palate of the epicure, has caused severe che

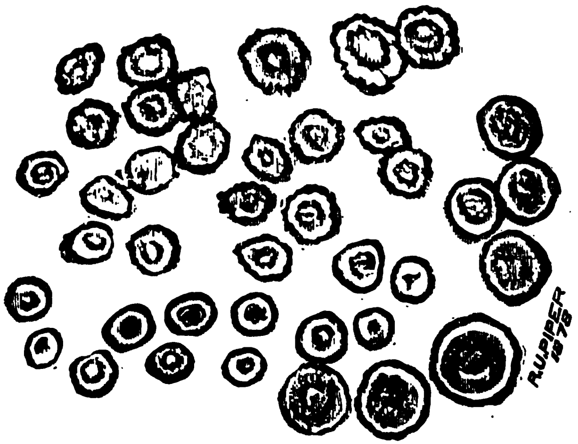


PLATE 3.—Group of blood forms from a patient suffering from large ulcers on the legs, following a course of hard drinking.

in those unaccustomed to its use." In 1839, on a fete day in Zurich, Switzerland, six hundred people were badly poisoned by eating such meat, which, like our epicures who pronounce swill-fed meat in every respect the best for human food, was so considered by the epicure purveyors of this feast. The symptoms in these cases were as follows: Shivering, giddiness, headache, burning fever, diarrhea and vomiting; some had delirium, others a fetid salivation and ulcers of the mouth, and, in other cases, collapse, involuntary stools, and great prostration preceded death. On dissection, the alimentary mucous membrane was found softened and the intestinal follicles ulcerated. The account adds the cause was found to be wholly due to the incipient putrefaction of the meat used on the occasion, this meat being, as I have noted before, in precisely the condition to please the palate of the epicure. This author tells us in this connection that "there are tribes of savages still further advanced in the cultivation of this department of gastronomy, who eat with impunity rancid oil, putrid blubber and stinking offal." The Digger Indians, as is well known, relish very much a dish made up of the putrid entrails of animals. This Digger's meat is no doubt in all cases developed in the first place from healthy food, so that these Indians cannot, if they would, reach the highest refinement of such gastronomy. It is left for our epicures to accomplish this result, by feasting on putrefying meat, which has itself been organized into form in the first place through the quadruped epicures themselves feasting on the putrefying leavings of the whisky still and the brewer's vat. These leavings, in the language of Prof. Tyndall, swarming with bacteria, vibiones, etc., both the product and the cause of putrefaction.

There is no doubt but that every one of these epicurian savages would laugh at us as do our whisky friends, were we to speak of the unwholesomeness of their odorous food, but should we be warranted in accepting the argument in either case as conclusive? They (the Indians) would point to the robust appearance of the members of their tribe, and boast of their power as hunters and warriors to disprove the charge. I, once upon a time—as the story books say—knew a man who used to get "mellow" every day upon New England rum (not whisky), who lived to quite an advanced age. This man would point to himself as a living example of the wholesomeness of his "steady drink."

As will be seen, I have not given these cases of meat-poisoning in order to prove the fact, for there are none so ignorant as to deny it, but to show how inconsequent are the arguments on the negative side of the question. I do not need, either, to argue the fact that various kinds of food eaten by animals render their flesh poisonous as an article of diet. These cases are too numerous to require repetition. The fact being admitted, then, that the flesh of animals may be rendered unfit for human food by that on which they may chance themselves to be fed, the subject narrows itself into this one question: Can this result be produced by the use of still slops or brewers' grains, used in whole or in part as the diet of such animals? That such a method of feeding produces diseased flesh is certain; the answer to the question, then, would seem quite obvious.

In regard to the effect upon the milk of such animals I can speak with positive knowledge. As I said in my former paper, I have made nearly or quite a thousand examinations of milk, both with the microscope and by other methods known to science, working days and weeks on the problem with the utmost care, keeping records of all my examinations both by drawings and daily notes, and am, therefore, prepared to meet those who make a negative statement, as it regards my conclusions, by at least requiring them to go through some such investigation before admitting their claim to any notice in the matter. I know that in hundreds of cases I have been able by means of the microscope to tell swill milk from healthy milk when put in my hands in a fresh state.

Nor is this at all a difficult task, and those who say it cannot be done only show their own ignorance in the matter. A writer in a New York periodical, who preceded me in this investigation, makes this statement, and it was through the testimony of this able microscopist that I was first led to make my long series of experiments in this direction, which have led to a like conclusion.

I do not mean to claim that I can tell the swill milk disease from other diseases in its effect upon the milk as seen under the microscope, for I have examined milk from sick cows in which I could perceive no difference, and in the fearful cattle murrain the same fact is shown by the drawings in the books. In my further examination of swill milk I have found it passing much more rapidly into the putrefactive process than other milk, and I have also met with quite a large number of severe and dangerous diseases among children produced by swill milk, and I have in my possession a number of like cases from physicians of eminence outside of the city. The above, however, is but a repetition of facts noted before. Taken this fact as fully proven, that the milk of swill-fed cows is thus poisonous, does it not seem reasonable to suppose that the *flesh* of animals fed in a similar manner may be also dangerous as an article of food? Is not the fact at least just ground for inquiry in the case?

We are told by the keepers of the animals themselves that in a longer or shorter time, some two years or less, the bony tissue of the animal becomes so diseased that the teeth no longer perform the office of mastication, that their tails drop off, and they are afflicted with horrible ulcers and other evidences of general disorganization. Does it appear reasonable that at any time during a process of feeding which will finally lead to this result, the flesh of an animal subject to such treatment could in any manner be fit for human food? We are told that the falling off of tails, ulcers, etc., are the effect of continuous confinement and are not due to the swill food. Do cows kept in confinement in cities thus lose their tails and become alike diseased when fed on proper food? Cows thus kept in Paris die of consumption and pneumonia, but they never evidence such symptoms. If the facts be true that these results described as taking place in the Brooklyn and New York distillery stables were due to the close confinement of the animals, how happens it that no other so confined animals, fed on proper food, showed any such symptoms? The facts in the case seem to be that the swill milk was the poison which caused the disease, which, like small-pox or other ailment in the human animal, becomes more or less virulent under varying circumstances. Criminals condemned to the quicksilver mines of Idria, and slaves under the old Spanish regime in the mines of Almeda, went through a course of—"decomposition" shall I call it?—similar to that manifested by the cattle fed on swill slops. The bones and teeth showed similar appearances of disease, and death followed generally in less than two years. Those who were allowed to go outside at frequent intervals, however, *often lasted much longer.* It would be hardly reasonable to admit that a

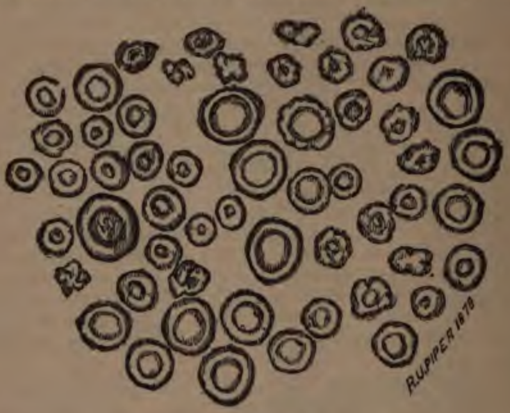


PLATE 4.—Blood from swill-fed cow.

method of treatment which thus inevitably caused death at last, could at any time during its continuance have produced a state of high health in those subjected to it. And yet this is what is claimed in the case of swill-fed cattle, who loose the use of their teeth in two years, unless we admit that diseased meat is better is every respect than healthy.

It has been claimed that the fat and sleek appearance of these swill-fed cattle is evidence of high health, but this is far from being the fact.

Dr. Von Tschudi tells us that the arsenic-eaters of Styria are distinguished by a blooming complexion and an appearance of exuberant health, but that this apparent health is but the precursor of a terrible death. The same practice, he tells us, is resorted to by the coachmen and horse-dealers at Vienna in order to produce "a sleek, round and shining appearance in the carriage horses," but this, he says, is no less a diseased appearance than in the former case, and though the practice is not so soon fatal as in the case of human beings, if it be once discontinued the animal becomes poor and thin, and loses all spirit, and it is found impossible by any method of feeding to restore him to health again. And this is also true in regard to other domestic animals. Lehman says that "fat cattle are often very far from being healthy cattle; that fat in human beings more often indicates disease than health, and that the fat and rotund whisky and beer drinkers are much more liable to attacks of cholera and other like diseases than those of spare habits, and are more likely to succumb when thus attacked."

I have one other statement to make before closing my paper. It is in regard to an examination of the blood of a swill-fed animal, which I have recently made. It will be remembered that the late Dr. Freer, President of Rush Medical College, made many investigations upon this subject, and that he was able, as he has often stated, to distinguish the state and condition of the patient in many forms of disease by examination of the blood under the microscope. While visiting the hospitals in Germany he was frequently put to tests of the kind, in not one of which did he fail to make a correct diagnosis. It was by his suggestion that I began a series of investigations upon this subject, during the course of which I have made more than thirty thousand drawings of the microscopic appearance of the blood of hundreds of human beings under the conditions of health and disease, and also drawings of the blood corpuscles of more than one hundred species of animals, wild and tame, some confined in cages, others, of course, such as domestic animals, in a comparative state of freedom. By means of these drawings I am able to refer back to the various cases which have come under my notice, and to compare them with more recent drawings.

In several cases of disease I have found a remarkable shrunken and withered appearance of many of the blood corpuscles, while a considerable portion retained their normal size. This was true in a case of a man who was making great efforts to get away from the results, not of the use of whisky slops, but from the use of the whisky itself, who presented himself for examination with large ulcers on both legs, and with evidences of great loss of vital power. In this case the blood was seen in groups of shrunken and normal-sized corpuscles, which was precisely the condition of the blood of the swill fed cow alluded to above

It will be remembered that in my article on milk I mentioned the fact of various living forms having been found in blood, such as bacteria in the blood of glandered horses, and in man and inferior animals affected with carbuncle and maglignant pustule; also in cases of epidemic dysentery and bloody urine, etc. May not this be a new kind of worm developed out of the slime or protoplasm evolved by the distilling process—a cogener, perhaps of the "worm of the still," and destined like it to slay its millions?

We have the most positive proof that the flesh of swill-fed cattle, like the milk from such animals, passes very rapidly into putrefaction. Hence it is preferred by that class of epicures that like to have their meat odorous as well as tender—or, as the ghouls of Eastern story, who require the human bodies on which they design to feast to remain a sufficiently long time in the grave to become rotten, in order that they may be savory enough to suit their delicate appetite.

R. U. PIPER.

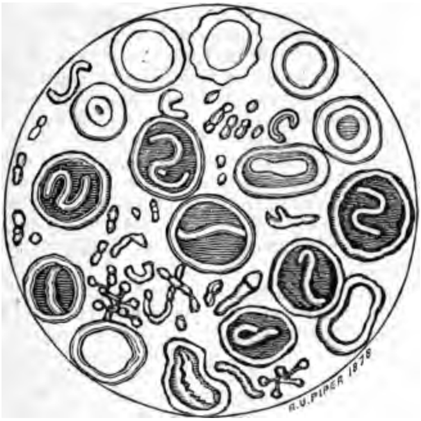
[From the Chicago Times. These headings are original with the Times.]

Swimming in Blood—In the Life Currents of Diseased Humans Float Myriads of Living, Active Organisms—And they are at Least First Cousins to those Found in the Blood of Swill-Fed Cattle—Microscopical Investigation Develops the Formation of Innumerable Crystals in Human Gore, which is Curious, if not Useful—Positive Proof that Swill-Fed Beef will Keep but One-Third as Long as the Healthy Article—Portraits of the Wriggling Wretches Brought to Light by Means of the Magnifier.

During a recent conversation with the editor of the *Times* upon the subject I have been discussing, I stated to him that I had discovered, in the course of my experiments, various living organisms in the blood of certain diseased persons, as also similar ones in connection with experiments upon animal flesh, which I intended as the basis of an article for a scientific journal. He suggested that those discoveries would serve to confirm what I had already written upon the subject, and might, therefore, prove to be of more public benefit, through a secular journal, than if printed in a purely scientific publication. At the risk of some repetition I have concluded to act in accordance with this suggestion. I have before alluded to organisms found in the blood of various animals, and have given in my published article in the *Times* drawings of diseased blood from hospital patients, also from swill-fed cattle, in which forms resembling worms are to be seen. These drawings were made from blood dried on glass slides, and hence cannot be said positively to represent what were once living organisms.

The authorities say that the blood of certain quadrupeds often contains entozoa; that is, living animal parasites. Von Duben speaks of filarie (a thread-like worm) in the blood of dogs. This worm is also sometimes found in the eye of the hare. The strongyli, round, cylindrical worms, with bodies sometimes entirely red, are found in the kidneys of the hare and dog, and sometimes in man. M. Duval states that he has seen fasciolæ—sometimes called distomæ, a small leech-like worm—in human blood. Brauell, as I stated in a former paper, asserts positively that he has observed vibriones in the blood of glandered horses. M. Davaine, of Paris, has announced the discovery of bacteria in the blood of both man and the inferior animals affected with carbuncle and maglignant pustule.

I give a case of my own in which I have found living organisms in human blood. This patient, like many of those which come under hospital treatment, [illegible] *with a so-call*ed inveterate humor, or breaking-out, tending to ulceration; and, what is also no uncommon fact in this class of patients, the exhilarating whisky and the "wholesome beer" had done their part toward making a very "beautiful case" in every respect. I give a description of this case from my notes made at the time: "The blood was very carefully taken from the arm, the skin being thoroughly washed with soap and water and then wiped dry. An incision was made by means of a spring lancet, and the blood put upon a glass slide and immediately covered with a thin glass cover, in the usual manner, and the slide then placed on the stage of the microscope. A magnifying power of one thousand two hundred and thirty diameters was used in making the examination. Almost immediately on placing my eye to the instrument I witnessed what to me was a most remarkable sight, that is, in fresh, fluid blood, the same activity of motion among apparently similar forms which I have so often seen in the appetizing fluid called milk, which is provided for so many of the good citizens of Chicago through the agency of the distillers, and under the sufferance of our scientific and efficient Board of Health.



It was difficult at first to catch the exact form of these active, living beings so as to make a drawing of them, but after some time they became somewhat quiet so that I had but little difficulty in accomplishing my purpose. For a considerable space of time after this blood was put under the microscope, these bacteria or entozoa, or whatever they might be, kept up a very constant and active motion among the blood corpuscles as they darted from one part of the field to the other. In several instances there was exhibited a whirling motion on the part of single corpuscles for half a minute or more; then this motion would cease in these cases and other corpuscles, seeming instinct with life, would perform the same dervish-like dance. I watched this blood for most of the time during ten hours, when the motion entirely ceased and the active forms outside of the corpuscles were lost from view, while those in the interior could be seen rather more distinctly than at first, in this respect agreeing with those on the dried blood slides. After the cessation of this motion among the corpuscles, they remained suspended and floated as freely in the serum as at first.

I have also taken dog's blood in two instances in which the serum and corpuscles are shown only in the form of crystals in the dried state on the uncovered glass slide. This fact in regard to spontaneous formation of crystals in blood while in the fluid state, as well as while undergoing the process of desication on the uncovered glass slide, may not appear to have any direct connection with my subject, but as it has grown out of investigations made at the request of the *Times*, it would seem proper that it should be given in this connection.

To connect this discovery of living organisms in the blood of a patient dying from the effects of stimulants and venereal disease with my subject, it certainly is a curious fact that I should find apparently the same living forms in the blood of the swill-fed animal and my patient; and, also, that in these terrible cases of venereal disease which frequently cause such wide-spread destruction of the bony tissue, the analogy of such changes should also be exhibited in this tissue in the quadruped. This contraction in the blood corpuscles is also seen in both animals under the two forms of disease, as shown by the drawing in my first article on this subject. I have noticed this effect in the blood corpuscles of a patient dying from a dose of poison, Indian hemp (*Cannabis Indica*), though the markings in the blood forms in this case were quite different from those noticed in venereal patients and in swill-fed cows. The worm-like forms were absent also. I have met with it in other cases of poisoning—in that of a cat killed by prussic acid, and of a rabbit by chloroform. It is also shown to be the constant fact in my experiments with reference to the effects of cold upon the blood corpuscles. All these causes, ending in the destruction of the animal organism, at least agree in this fact, of the contraction of the corpuscles with that seen in the blood of swill-fed cows. That it is not at all due to confinement is shown in my drawing of the blood corpuscles of some forty animals kept in cages in a menagerie.

My experiments upon swill-fed beef were made with a small specimen of meat from an animal which, to my own knowledge, had been kept for some time in the distillery stables. This meat, weighing some three or four grains, was obtained three months since, when it was fully dried to powder and kept in a close-stopped vial. The vial, previous to its use for this purpose, was washed out with carbolic acid water and dried in a hot stove. The stopper was also treated in a similar manner, in order to prevent the development of fungi by means of spores received from the air. This powdered meat preserves its perfect dried form at this present writing, but that it is pregnant with germs of living organism can be made evident by placing the smallest atom of it in water and allowing it to stand for from two to five hours, with the vial still closely corked.

There is something fearful in the rapid development of such organisms (the cause and result of putrefaction) in such countless numbers out of what is put on the market as good and wholesome food.

It will be seen that the whole drawing represents but a small part of a drop of this living soup, being magnified nine hundred diameters, that is eight hundred and ten thousand times. How many of these "delicious vermin" must we be compelled to swallow when we take a "hasty plate" of this soup—and "all for the good of the distillers."

In his recent lecture, delivered Dec. 10, in London, Prof. Tyndall repeats what he has said many times before, that there can be no putrefaction without the presence of bacteria; and in a standard medical work just published, it is stated that in cases of patients dying while suffering under chronic diarrhœa the lining membrane of the whole intestinal canal has been found completely alive with these organisms. This, I think, will be found to be the case upon a similar examination of the mucous lining of the intestinal canal of swill-fed cattle, for they are one and all afflicted with constant diarrhœa, as I myself have witnessed, and as I am assured by the reporter for the *Times*, who made a thorough and conscientious investigation of the whole subject, and also by a host of credible witnesses, who have had full opportunity to know of what they speak. It has also been stated by the highest medical authority in the city that swine thus fed are almost all of them afflicted with Bright's disease of the kidneys, and it is but fair to suppose that other animals so fed may be liable to the same disorder.

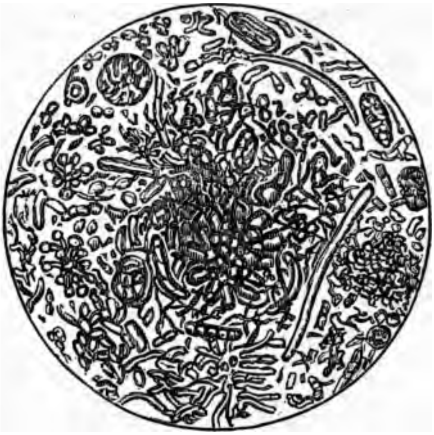


FIG. 4.

The drawing, (fig. 4) was made up from a small portion of a drop of this water, placed under a magnifying power of nine hundred diameters, and also from water in which some of the same meat-powder had been boiled, taking care, after Prof. Tyndall's method, to prevent the access of external germs by plugging the test tube in which the boiling took place with a lock of cotton. It required some ten hours to develop these forms under this last condition.

I do not mean to be understood to infer that the many cases of this disease which are now so common in the community, and which so often come under my notice, are produced through eating the flesh of such diseased animals; there exists as yet no proof either way to my knowledge.

In further continuation of these experiments, in order to show the rapidity with which the contagium of putrefaction is propagated, I took some fresh, healthy meat, and, after having it broiled over an open fire, as in my former experiments, I boiled portions of it in test-tubes, plugging the tubes with cotton, as before described. In one of these tubes I next put the smallest possible portion of the "swill broth." (I had almost given it the name of the witches' broth, In Macbeth.) In an incredibly short space of time the fluid in this tube was rendered opaque with writhing, struggling forms, seen in the drawing, while that in the other tube remains perfectly clear up to the present time.

Morand, in his "*Histoire d'une Maladie tres-singulaiere,*" says if the "blood or raw flesh of an over-driven animal be applied to a scratch, or on the unbroken skin of a human being, a dangerous and often fatal inflammation is excited." He has not witnessed such an effect where this flesh has been cooked and eaten. Still we should not feel safe in trying the experiment. An eruption of gangrenous boils, ("*pustules malignes*" of the French) is often present in these cases, and it is by no means improbable that the fatal results which have been attributed to the mere handling of the flesh where there was no abrasion of the skin were due to the use of it as food.

The *Milsbrand*, of Germany, described in Annali Univ. di Med. 1871, and by Kopp and others, may be considered as having a direct bearing upon my subject. This malady, says the authorities, has the property of rendering the solids and fluids poisonous to so great a degree that persons who handle any part of the animal or who eat the flesh are often fatally poisoned by it. "The affection thus produced in man is sometimes inflammation of the intestinal canal, or cholera, but more often a disorder precisely the same as the pustule maligne, but most frequently of all, an eruption of one or more large carbuncles, the same as those in the original disease of the cattle themselves. It is often fatal. The carbuncular form has been known to cause death in forty-eight hours.

Here it will be seen that a disease originating in the lower animals has been reproduced in the human body, precisely in its original form, by eating the cooked flesh of such animals. If there exists no proof that Bright's disease has been produced in this manner, it is equally as certain that the contrary has not been proven. I have several times met with this disease in cases which have been sent for examination, in which quite different maladies were suspected. The analogies in the cases are at least just ground for careful investigation. "Naturally wholesome or hamless animal matters," says Christison, "may become irritant poisons through the ordinary processes of putrefaction. The mere commencement of decay is sufficient to render meat poisonous to those unaccustomed to its use." The fact that habit seems to render it safe in some cases, is no criterion by which to judge of its effects when taken under other conditions. Nor is it believed that those who are habituated to its use often escape with entire impunity. Frequently, as in cases of habitually intemperate persons, the slightest scratch or injury is sufficient to put in operation causes which needed but this slight impulse in order to go on to their legitimate end. Putrid animal matter, when injected into the veins of healthy animals, quickly proves fatal. Gasperd, Magendi, and MM. Leurunt and Hammont remark that the symptoms so produced resemble those exhibited in typhoid fever in human beings. In experiments made upon dogs by those gentlemen, by merely imprisoning them as cattle are imprisoned in the distillery stables, they were able to produce those typhoid symptoms. The right conclusion seems to be, in case of the flesh of swill-fed cattle, that it is rendered doubly dangerous by its always being in a diseased condition, no matter how fresh it may be eaten, and by its rapid tendency to decay, which renders it difficult to keep it for a short time even, if at all, without its manifesting signs of putrefaction. If it is not capable of producing special diseases, such as Bright's disease of the kidneys, which is by no means proven, it must be dangerous, as stated by the authorities, for the reasons quoted above. And here, surely, in such a grave question as this, where the safety and health of the people are at stake, it would seem to be the part of wisdom to demand absolutely that the negative of all these propositions should be proven, and that until this has been accomplished, swill-produced beef, as well as swill-milk, should be wholly banished from the market.

Since writing the above, I have made quite a number of examinations of flesh, blood, etc., of hogs dying of cholera, and have found organisms in these cases resembling those before described, as seen in the blood of still-fed cows, and, in some instances, in the blood of human beings. The forms of the blood corpuscles in hog cholera, as shown by me under the microscope, are precisely like those described by Beal as seen by him in the "*cattle plague*," and figured in his work, " The Microscope in Medicine," p. 264, fourth edition.

R. U. PIPER.

Dr. Piper Indorsed.

To the Editor:

I have been a reader of your valuable paper for several years; and, as such, I wish to ask a small space in your columns for the purpose of placing before your many readers my opinion upon the use of milk from still-fed cows, which has no doubt caused a slight sensation in your city. My opinion has partly been expressed by Dr. Piper, with whom I heartily concur in his statements. The great question seems to be: Is milk from still-fed cows injurious to the health of the consumer? To this question I answer most emphatically it is; and I will now briefly assign my reason:

As has been stated by Dr. Piper, who has very minutely examined the milk and still-slops, it contains a class of vegetable parasites known as the bacteria, which are foreign to animal organism, and which, if introduced into the human system, will, if not soon eradicated, produce an acute infectious disease.

I have carefully analyzed slops from the distillery, as well as the milk from cows fed upon the same, and am prepared to stand by Dr. Piper in the position he has taken; and if it be necessary can exhibit before any society or committee a test which will satisfy all who may have any doubt in regard to the matter.

L. Delafontain undertakes, in your issue of the 6th inst., to overthrow the argument of Dr. Piper; but I fail to see, in a single instance, where he has succeeded in calming the public mind. He acknowledges that the above-named parasite it found in the still-slops, and goes on to say that it is sometimes, not always, found in the blood of human beings; but does he say they are conducive to the health of the individual? No, sir; his better judgment tells him such is not the case.

He also says the use of still-slops is not confined to Chicago. I am aware of that fact, as every sane person must be. I do not care if it was used in every city, town, hamlet and village in the United States, that is no evidence of its being healthy food for man or beast.

He says it has been used in Paris for one hundred and eighty years. Now, let me ask the gentleman to mention a class of civilized people upon the face of God's green earth who are troubled with more infectious diseases than those of Paris. I would call his attention to the reports of the Board of Health of Paris.

Let the reader bear in mind that all those peculiar diseases, known as " anti-infectious diseases," are caused by the introduction of foreign matters into the system, and that they are introduced by becoming mixed with the food we eat, or the air we breathe. Let them also remember the statement I have made above, that the parasite known as bacteria is foreign to the human organism, and that anything foreign will, undoubtedly, produce disease, and they will readily decide that anything which contains the bacteria, whether it be still-slops, slops from the kitchen, or milk from cows fed upon the same, would be injurious to their health. J. E. HAINLINE, M. D.

From Prof. E. M. Hale, M. D. CHICAGO, Feb. 1.

DR. R. U. PIPER—*Dear Sir:* Some time ago you requested me to give you the particulars of some singular and severe cases of poisoning from the use of diseased milk. During the last few years my somewhat extensive practice among children has enabled me to realize the danger accruing from the use of such milk, and I have awaited with much impatience the action of the Common Council in the matter.

Case 1. Was a child, 4-months-old, on Calumet avenue. The mother could not nurse the child, and it was put upon the bottle. The milk was from a small dealer on the South Side, who was "ready to make oath" that he never fed his cows on swill. But the same day the child commenced using the milk, it was attacked with what appeared to be violent pains in the stomach, followed by offensive diarrhœa and acid vomiting. The milk was prepared as follows: One-half water and a little sugar. The usual remedies were given, and the child was fed with barley-water, slightly sweetened. It rapidly recovered, and in a few days was given the same milk, with the same results. I learned afterwards that several other children fed on the same milk had to be taken from it on account of the intense gastric derangement following its use.

Case 2. A little girl on Prairie avenue, aged 6, who had been ill for a year or more, was obliged, on account of the failure of the family cow, to drink milk supplied by a milk-man who lived just west of State street. In half an hour after taking her first drink at the table, the child was seized with violent vomiting and purging and great prostration, and did not fully recover for several days. The family did not think the milk was at fault, but, rather, something the child had eaten. When the child had recovered, it was given a glass of this milk one evening on retiring, and in a few hours she was attacked with all the symptoms of cholera morbus, but the dejections had a peculiarly offensive, putrid odor. I advised the parents to procure milk of another dealer, and the child had no more attacks.

Case 3. A family in which were three small children came from a suburban village to pass the winter in the city. They procured milk of one of our small dealers, who "kept a few cows and fed them with the best of food," as they always assert. This milk was first used at breakfast, and within ten minutes after drinking it, before they had eaten anything else, all three children were attacked with violent pain in the stomach, so intense that they screamed and writhed on the floor in agony. I could hardly believe that such violent symptoms could occur so soon after partaking of the milk, even if it was poisonous. The father interviewed the milk dealer and was assured that the food of the cows consisted of bran, hay, and the refuse of the kitchen. After a few days the children were allowed to drink of the milk, this time after a breakfast of bread and butter. The result was the same as at first. It is noteworthy that the milk was scalded for one of the children, but it made no difference. What a violent poison it must be not to be destroyed by boiling?

The people of this city will be greatly indebted to you, my dear doctor, if you are able to put an end to this infamous traffic in impure milk.

THE SO-CALLED "BLOOD CURE."

A few days ago a lady came under my care, who came here from a town in this State. She was weak and emaciated from a disease of the digestive tract, which baffled the best medical skill of the town. Some friend, who had read of this blood cure, advised her to come to the city and drink blood procured from the slaughter-houses. With great effort she was brought to this city, and taken every day to some shamble near Bridgeport, where she drank of blood which had recently flowed from cattle killed there. She became worse, and I was called in.

You will remember that I advised them to subject some of the digestions to your analysis and the frightful appearance they presented. You will also remember that after forbidding any more " blood-poisoning," I ordered her to partake of no food but Kumyss, and how surprised you were to find the dejections change so soon to such a healthy state. You have, doubtless, recently read the announcement of the eminent German pathologists, that the blood in the cavities of the bodies of animals slain by concussion (blows on the head) very soon changes to a sceptic poison. Now, is it not possible that the blood may be in this condition when drank at the slaughter-houses? But, even if such be not the case, how do we know that the blood is not poisonous from other causes? The blood is not always pure. The slightest disease, not perceptible in cattle while living, may render it poisonous. The blood contains the elements of the body that is to be, and also the sewage of the present body, and the effete materials which result from its breaking down. Think of drinking the blood from diseased Texan cattle, or cattle from any place, after days of journeying in close cars, without sufficient pure water, and in a feverish and excited condition! The idea is not only too horrible to contemplate, but the practice should be prohibited by law. I hope you will turn your attention to this matter and show the public the filthiness and the dangers of such an abominable practice as the one above referred to. Very truly yours,

EDWIN M. HALE.

LETTER FROM DR. RICHARDSON,

Professor of Hygiene in the University of Pennsylvania.

No. 1835 Chestnut Street,
Philadelphia, January 30.

R. U. Piper, M. D.—*My Dear Doctor:* I have read, with much interest, your two newspaper articles on swill milk and blood, and, although their headings are rather sensational (at least would be so in the longitude of our Quaker city), I can heartily approve of the *eloquent* and *forcible* way in which you attack the accursed traffic in swill-fed milk and beef. As a professor of hygiene, in the University of Pennsylvania, I take a great interest in this *very important* subject, and wish you every success in your crusade against the abominable traffic. It seems to me it only needs to be thus courageously and thoroughly exposed to cause the people to punish these Herod-like murderers of their beloved children. I thank you most sincerely for the articles, and wish I could have seen specimens of the blood of that patient you refer to in your first paper. By the way, you will find some valuable support for our doctrines in regard to the existence of "vegetable organisms in human blood" in Dr. Orth's "Diagnosis in Pathological Anatomy," New York, 1878.

Hoping to hear from you again soon, I remain, in haste, yours sincerely,

JOSEPH G. RICHARDSON.

LETTER FROM EPHRAIM CUTTER, M. D.

Author of "Review of Dr. Salisbury's Microscopic Examinations of the Blood," "Treatment of Consumption by Animal Food," "Rural Micrography," "Microphotographs of Mammalian and Comsumptive Blood," Etc., Etc.

Boston, February 22, 1879.

Dr. R. U. Piper, Chicago:

My Dear Sir.—For many years I have have had great sympathy with every project to secure pure milk for domestic consumption. A late effort in this direction in Boston was thwarted by middlemen, by methods which would be worthy of the arch-fiend himself. The greed of milk-men is sacrificing scores of children every day ; far more than were immolated on the altars of the ancient Moloch. I write as I have felt for many years. God bless any and all efforts to give to children the natural right they have to healthy food. The cause is a good one, and sure to succeed at last. I have long known you as an indefatigable and thorough worker, and shall always be counted on to stand by you in your battle with the terrible giant ogre who devours so many helpless infants, and other innocent persons.

Respectfully, EPHRIAM CUTTER.

PROF. RICHARDSON'S SECOND LETTER.

Philadelphia, 1035 Chestnut St., Feb. 14, 1876.

R. U. Piper, M. D.:

My Dear Doctor.—Many thanks for your pamphlet in which you have so ably exposed the dangers of swill-milk. I do hope and trust it will be of real service to the community in opening their eyes to the poisonous nature of what goes down their own and their children's throats. I should be glad to have one or two more copies of your work if you can spare them. Have you seen my lecture on the Germ Theory, before our Social Science Association? I send a copy in case you have not met with it. I remain,

Sincerely yours,

JOS. G. RICHARDSON.

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